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ABSTRACT

It is noted that compared to the research base on effective practices for teaching primary level children, the volume of published research with intermediate level students is modest. The studies and summaries reviewed for this document include those which: (1) sought to identify a cluster of teaching strategies and behaviors which are positively related to student achievement and affective outcomes; (2) compared a specific instructional approach to one or more approaches; and (3) looked at the relative efficacy of different organization/scheduling arrangements for conducting mathematics and/or science instruction with intermediate level students. Forty-four documents were reviewed during this investigation. The bulk of this manuscript consists of individual item reports on these reviewed documents. Four major hypotheses emerged from the examination: (1) instruction which features active, hands-on experiences has a positive effect on the mathematics and science achievement of intermediate level students and enhances the attitudes of these students toward the subject matter; and (2) the instructional approaches known as direct instruction and mastery learning are more effective than other approaches in promoting the mathematics and science achievement and retention of intermediate pupils, and also foster positive student attitudes; (3) individualized intermediate level mathematics and science instruction confers greater achievement and retention benefits than does instruction with no individualization; and (4) no one organization/grouping pattern is inherently superior to others for instructing intermediate students in science and mathematics. Five recommendations are made based on the review. (MP)

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INTERMEDIATE LEVEL
MATHEMATICS AND SCIENCE INSTRUCTION

Research Synthesis

Prepared by:

Kathleen Cotton, Dissemination Services Program
William G. Savard, Audit and Evaluation Program

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August 1982

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PREFACE

This report is one of a series of reviews of research literature conducted in response to the priority concerns of clients of the Northwest Regional Educational Laboratory and of educators nationally. Each of these reports addresses a topic which is deemed to have an impact, actual or potential, on school effectiveness. All of the reports have been generated using the same general approach and a common reporting format.

Originally developed for a project supported by the Alaska Department of Education, the review process begins with a topical literature search using both computer-based ERIC and conventional library methods. Articles and other documents found are analyzed and abstracted into a brief form called an Item Report. Each of the items is then judged against a set of pre-established criteria and ranked on a five-point scale. The collection of Item Reports is then examined for purposes of identifying issues. These issues are stated in the form of a hypotheses. Each hypothesis thus generated becomes the subject of a Decision Display. A Decision Display is created by sorting the Item Reports into those which support and negate the hypothesis, are inconclusive, are badly flawed, or are irrelevant. One or more Decision Displays are generated for each topic addressed. A Summary Report is then generated from the consideration of the Decision Displays and the file of Item Reports. Thus, each complete report in the series consists of a Summary Report which is backed up by one or more Decision Displays which in turn are supported by a file of Item Reports. This format was designed to accommodate those readers who might wish to delve into various depths of detail.

This report is not intended to represent the "final word" on the topic considered. Rather, it represents the analysis of a particular collection of research documents at this time. There may be other documents that were not found because of time or other limiations. There may be new research published tomorrow. This present report represents our best judgment of available information at this time. This format allows for modification and re-analysis as new information becomes available or old information is re-interpreted.

For a more complete description of the analysis process see William G. Savard, Procedures for Research on School Effectiveness Project, Audit and Evaluation Program, Northwest Regional Educational Laboratory, December 10, 1980.

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Introduction

The ability to understand mathematical concepts and apply mathematical skills is basic to functioning effectively in school, working life and personal life. Likewise, comprehension of the principles of scientific inquiry is an important aspect of clear reasoning and critical thinking generally, as well as being essential grounding for pursuing any sort of scientific or technical career training. General agreement about the importance of these skills--including recognition of how seriously an individual is impaired if he or she does not possess them--lies behind much of the current concern about effective instruction in basic skills at the elementary school level.

Students clearly require a strong beginning curriculum and high-quality teaching at the primary level if they are to become capable mathematicians and critical, "scientific" thinkers. Recognizing this need, researchers have directed considerable effort toward investigating strategies and approaches for introducing math and science content to primary-age children and building on that introduction through the primary years. Much of what we know about educating primary level children has emerged from mandated evaluations and other investigations of federally funded programs for beginning learners.

While not all areas of contention have been resolved, the large volume of research conducted with primary level children does enable us to draw some reasonably well-founded conclusions about effective instructional practices with these children. We know, for example, that mastery learning programs have proven very effective for fostering skill development in beginning mathematics, science and other areas where well-defined processes and prespecified outcomes make up much of the instructional content. It has also been demonstrated repeatedly that the instructional practices which make up the method known as direct instruction are effective for teaching basic skills to young children.[1] And research has produced an impressive body of findings indicating which kinds of organizational, grouping and scheduling arrangements seem to work best for educating these children.[2]

Compared to the research base on effective practices for teaching primary level children, the volume of published research with intermediate level students is modest, and fewer summaries of that research have been published. Even so, a notable amount of good research does exist concerning mathematics and science instruction for intermediate level students. Much of this research is concerned with identifying those practices which can enable students to build on their learnings from the primary years, but attention has also been given to investigating remedial approaches for students who have not successfully mastered the instructional content taught at the primary level.

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[1] See Kathleen Cotton and W.G. Savard, Direct Instruction and Mastery Learning. (Portland, OR: Audit and Evaluation Program, Northwest Regional Educational Laboratory, 1982.)

[2] See Kathleen Cotton and W.G. Savard, Class Size, Instructional Grouping: Group Size, Instructional Grouping: Ability Grouping, and Time Factors in Learning. (Portland, OR: Audit and Evaluation Program, Northwest Regional Educational Laboratory, 1981, 1982.)

The research studies and summaries reviewed in preparation for this report are of three general types: (1) those which sought to identify a cluster of teaching strategies and behaviors which are positively related to student achievement and affective outcomes; (2) those which compared a specific instructional approach to one or more other approaches to determine which one(s) produced the most positive achievement and affective outcomes; and (3) those which looked at the relative efficacy of different organization/ scheduling arrangements for conducting mathematics and/or science instruction with intermediate level students. Because no two researchers or reviewers were concerned with the same set of variables, the findings emerging from the current investigation cover a wide range. The next section of this report displays the outcomes of our attempt to cluster these diverse findings into some general statements about effective instructional and organizational approaches.

Forty-four documents were reviewed during the present investigation. Four were excluded owing to poor research designs, irrelevance to the current areas of interest, or other factors. Of the forty valid and relevant research efforts which were examined in detail, 25 were identified and retrieved specifically for this report, and 15 were drawn from the base of support materials already assembled for other reports in this series. In the latter instance, it was found that some of these materials, while they were originally studied with different topic areas in mind (e.g., computer-assisted instruction, ability grouping) were also highly relevant to the current analysis.

Thirty-four of the documents were reports of primary sources (studies or evaluations), five were secondary reviews or syntheses, and one reported the findings of both a study and a review effort. Thirty-one of the items were concerned with instruction in or organization for mathematics, eight for science and one for both areas. Thirty-seven reports focused on one or more of the intermediate grades, one concerned grades K-8, and two reported findings for grades K-12.

Several student outcome areas were studied. Student achievement in mathematics and/or science was the total or partial focus of 38 of the reports reviewed. Other outcome areas investigated included student attitudes (15 reports); retention of learning material (six reports); and level of student participation, classroom behavior, quality of the learning environment and student engaged time (one report each).

In the discussion of findings presented in the next section, statements made about instruction in science must necessarily be regarded as tentative, as relatively few documents regarding science instruction were retrieved. Assertions about effective instructional practices in mathematics rest on a much larger base of information, and can, therefore, be offered with greater confidence.

Findings

Fourteen of the studies and reviews examined were concerned with the relative merits of a traditional instructional approach (featuring textbooks and other print materials, teacher lecture, homework and in-class seatwork) and instruction which includes these traditional elements plus some sort of active, hands-on learning experience. In mathematics instruction, for example, some of the studies were structured so as to compare a traditional approach to approaches which included the use of manipulative materials (those which appeal to several senses and are used by children for physical involvement in an active learning situation). Other studies investigated the comparative achievement effects of traditional approaches and materials when

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supplemented by computer learning, exercises involving the use of calculators, or instruction and practice in using measurement instruments. In settings for teaching science content and processes, textbook-oriented instruction was compared with instruction which offered laboratory experiences, demonstrations and field trips, in addition to lecture and textual presentations. The volume of such studies and reviews led to the hypothesis that instruction which features active, hands-on experiences has a positive effect on the mathematics and science achievement of intermediate level students and enhances the attitudes of these students toward the subject matter.

Whether the situation studied involved students learning concepts of shape and volume using cut-outs and containers, dissecting frogs in science labs or playing mathematical games as part of a computer-assisted instructional sequence, the overriding finding was that activities which include a physical interaction with manipulable materials result in higher achievement than those which employ traditional methods only. Thirteen of the fourteen investigations produced findings to this effect.

Researchers who have studied the effects of active learning are quick to point out that these experiences are most effective when they supplement the development of conceptual understanding and skills acquired through textbooks, lectures and so on; they do not, in general, recommend that these more traditional instructional mainstays be scrapped and replaced by other methods. When, however, conventional instructional approaches are used in combination with hands-on activities, the achievement benefits are superior to those obtained through the use of either method by itself.

Moreover, students like these active learning experiences. In both the mathematics and science studies which looked at student attitudes, findings were to the effect that the active learning participants had more positive feelings about the subject matter and greater motivation for further learning than did those students who learned by traditional methods only.

A second hypothesis which suggested itself during the review process is that the instructional approaches known as direct instruction and mastery learning are more effective than other approaches in promoting the mathematics and science achievement and retention of intermediate level students; these approaches also foster positive student attitudes. Support for this hypothesis can be found in 14 of the 16 reports which addressed these topics. Having developed and published synthesis papers on these two instructional approaches, we shall not provide full detail here on the strategies associated with them. However, it is important to note that classroom researchers investigating mathematics and science teaching and its outcomes have repeatedly found these methodologies very powerful for building skills and understanding in these areas for students in general.

Basically, direct instruction, whether this term is capitalized and used to denote a specific instructional program or is used to describe a particular cluster of teaching behaviors, involves the use of highly structured materials, narrow and direct teacher questions, reinforcement of, and feedback on, student responses, and relatively rapid instructional pacing. Mastery learning calls for these same teaching strategies and, in addition, involves the use of formative testing, diagnostic analysis and remediation activities for students whose initial performance is below an acceptable criterion level. These approaches have been found to be most effective of all for those curricular areas such as mathematics and science, in which there are many fixed processes and prespecified correct answers.

In citing these methodologies as especially compatible with and effective in mathematics and science teacing, we are really identifying the research support for a group of instructional strategies that many seasoned teachers have found effective, whether or not they are termed direct instruction or mastery learning. These strategies include offering challenging drill and practice activities, closely monitoring student progress, providing clear explanations or new material and operating out of a strong respect for school time by teaching "at a good clip" and keeping students on task during seatwork activities. In contrast, research does not offer much support for open-ended, student-directed learning in these curricular areas.

Eleven of the studies and reviews compared the effects of some form of individualized instruction with those produced by instruction that was entirely group based. Review of these investigations led to the hypothesis that _individualized intermediate level mathematics and science instruction confers greater achievement and retention benefits than does instruction with no individualization_. The term "individualized instruction," of course, is used to describe a variety of ways of providing learning activities in response to the abilities and needs of individual children. Often these "individualized" approaches have little in common with one another, and they vary greatly in how far they diverge from group-based instruction and move toward total programs calibrated to meet each child's needs.

Acknowledging these differences, we do find strong support (in 10 of the 11 reports) for instruction which is individualized or which includes some degree of individualized work within a group-based program. Several specific components of individualized learning were identified in the studies as responsible for the greater achievement of learning in this way. Among these were: (1) students having the opportunity to move through learning material at their own rates; (2) the relative absence of pressure and competition; (3) specific individualization methods (e.g., computers, manipulatives) which motivate students and confer a greater sense of reality upon the concepts to be acquired; (4) the challenge of working with material which is appropriate to the students' ability level at any given time.

Conversely, some researchers identified exclusively group-based approaches as detrimental to student achievement and attitudes. Instruction delivered with no accommodation to individual needs and abilities has been found to overburden and intimidate many students, while others in the same class become bored and lose their motivation and interest in the subject.

Looking at the kinds of organizational arrangements utilized in the studies and reviews, we advanced the hypothesis that no one organization/grouping pattern is inherently superior to others for instructing intermediate level students in science and mathematics. Classroom organization/grouping was the major focus of sixteen of the forty studies in the present research base. There is, in other words, a great deal of interest in determining which structure is best for delivering mathematics and science instruction to these students.

The overall finding is that there is no such creature as the "best" organizational structure. While three studies found differences favoring one pattern or another, most failed to find such differences. Many kinds of comparisons were made between and among small groups, large groups, individual study, self-contained classrooms, open classrooms, single-teacher instruction, team teaching, heterogeneous and homogenous ability groups, etc. These comparisons were further examined in terms of their effects on students of different ability levels, from urban as opposed to rural settings, and in relation to various other characteristics.

The absence of support for any one instructional arrangement for intermediate level students in general is consistent with findings emerging from other investigations conducted during the course of this research synthesis project.

Conclusions

For intermediate level mathematics classes, the inclusion of activities which call for the active, physical involvement of students with curricular materials enhances student achievement, motivation and attitudes. Through involvement with computer exercises, manipulative materials, measuring devices and the like, mathematical concepts are made meaningful, and interest in building on previous learnings remains high. For science classes, activities such as student projects and presentations, field trips and laboratory experiments have a similarly positive effect on achievement and affective outcomes. It is also worth noting that these hands-on supplementary activities have been shown to be especially effective with students in remedial instruction settings. Apparently, students who have experienced problems of understanding and retaining mathematics and science content, as taught through conventional methods, experience increases in their ability to grasp this content when it is reinforced by hands-on learning activities. For these students--and for students generally--these activities are best offered as supplements to the traditional instructional components of lecture, discussion, textbook utilization, in-class seatwork and homework assignments.

Direct instruction, mastery learning and other instructional approaches characterized by tightly structured, briskly-paced lessons; reinforcement and feedback; and remediation activities based on formative test results, are effective in fostering achievement and attitude gains among intermediate level students in science and mathematics. These classroom methods, which may be regarded as the opposite of an intuitive or discovery approach, are especially powerful in transmitting instructional content which is largely factual, sequential and involves grasping and utilizing pre-established processes. Thus, the most positive results have been obtained when these approaches have been used in mathematics and science classes, as compared to subjects in which the content is more fluid and open to interpretation.

Instruction which includes at least some degree of individualization is extremely beneficial in its effects on student learning. Whole class, group-paced instruction alone is, conversely, detrimental for many students. As explained by some researchers, the reasons for this inhere both in the kinds of content to be mastered in mathematics and science and in the very different learning capacities of students. There is always a high degree of likelihood that instructional approaches, pacing and materials aimed at some hoped-for midpoint will fail to meet the needs of many students, boring some and leaving others to struggle through new material without having learned the necessary prerequisities. Introducing even a modicum of individualization into a hitherto entirely group-based learning setting has been shown to make a great deal of difference in student achievement and frequently in motivational level as well. According to the author of an extensive and detailed research review, "Individualizing instruction is a challenging task for teachers, but the price for not attempting it is very, very high."

Decisions concerning classroom organization and grouping for mathematics and science should, as one reviewer concluded, be based on teaching strategies utilized, students' needs and teacher preference--not on notions of any one inherently best classroom structure. If the teacher is comfortable, able to monitor classroom behavior and keep students on task; if the classroom arrangements are compatible with the teaching strategies employed; and if the children are motivated and learning, then those classroom arrangements are the "best"--whatever they might be and however unworkable they might prove in some other instructional situation.

Recommendations

With these learnings in mind, we make the following recommendations:

1. Curriculum developers, administrators and teachers are encouraged to identify/develop and offer instructional activities which feature touch, movement and interaction with learning materials as part of intermediate level mathematics and science curricula.
2. Educators are advised to familiarize themselves with the principles of mastery learning and direct instruction, and to give consideration to implementing intermediate mathematics and science programs based on these principles. (Readers are encouraged to consult our papers on these topics.)
3. We recommend that currently operating instructional practices in mathematics and science be reviewed with an eye to increasing the degree of individualization included in these practices.
4. We recommend that decisions about classroom organization and grouping be left to the discretion of individual teachers and that the structures used be reviewed only if they appear to be ineffective.
5. We recommend that school and district planners review the research findings in relation to one another, in order that decisions reached can be based on what we have learned in all of the areas investigated.

INTERMEDIATE LEVEL MATHEMATICS AND SCIENCE
Decision Display
#1

Restatement of issue as a hypothesis:

Instruction which features active, hands-on experiences has a positive effect on the mathematics and science achievement of intermediate level students and enhances the attitudes of these students toward the subject matter.

Items which tend to support hypothesis:

Item Number	Short Title	Quality of Rating of Study (5=High)	
351	Driscoll, 1980, Research Within Reach-Math	[5]	
133	Anderson, n.d., Task Behavior and Achievement	[3]	
342	Cooney, et al., 1981, Two Strategies/Two Skills	[3]	
350	Gershman & Sakamoto, 1980, Intermediate CAI	[3]	
333	Haertel, 1978, NSF Review	[3]	(studies generally support)
334	Lysiak, et al., 1976, Title I CAI	[3]	
345	McMillan & May, 1979, Student Attitudes Toward Science	[3]	
325	Miller, 1981, Science Teaching Behaviors	[3]	
348	O'Sullivan, et al., 1981, Science Teacher Inservice	[3]	
3	Ragosta, et al., 1980, Computer-Assisted Instruction Longitudinal Study	[3]	
330	SEDL Rx, 1979, R&D Speaks in Math	[3]	(studies generally support)
326	Szetela, 1981, Calculator Study	[3]	
344	Wollman & Lawson, 1978, Proportional Reasoning Study	[3]	

Items which tend to deny hypothesis:

Item Number	Short Title	Quality of Rating of Study (5=High)
328	Daume, 1980, Science Content and Process	[2]

Items which are inconclusive regarding the hypothesis:

None.

Item Number	Short Title	Quality of Rating of Study (5=High)
Items which were excluded because they were weak:		
	None.	
Items which were excluded because they were judged to be irrelevant to this hypothesis:		
100	Moody, *et al.*, 1972, Class Size/Math	
146	Deady, 1969, Science Achievement & Attitudes	
147	Carnahan, 1980, Teacher Planning	
187	Brown & Wunderlick, 1976, Open Education & Ability Grouping	
191	Hirsch, 1976, Math Research Review	
192	Brassell, *et al.*, 1980, Math Achievement & Attitude	
204	Dewar, 1963, Sixth Grade Ability Grouping	
205	Plewes, 1979, Mixed Ability Teaching	
206	Gabel & Herron, 1977, Effects of Grouping and Pacing	
207	Provus, 1960, Homewood Grouping Study	
292	Ward, 1979, Australian Math Study	
297	Burrows & Okey, 1975, 4th and 5th Grade Geometry Study	
300	Taylor, 1975, Adaptive Mastery	
323	Emmer, 1981, Jr. High Math Study	
324	Fisher, 1981, Remedial Math	
327	Daruwalla, 1979, Newspaper in Math Instruction	
329	Peterson, *et al.*, 1980, Large and Small Group Math	
331	Nivette, 1979, Math and Reading Evaluation	
332	Saunders & Yeany, 1979, 7th Grade Science Study	
335	Yoshida, 1980, Effects of Drill Practice	
336	Ebmeier & Good, 1979, Effects of Inservice	
337	Dekkers, 1979, FAST and Student Preferences	
338	Madike, 1980, Microteaching Study	
339	Madike, 1980, Microteaching & Achievement	
340	Bright, *et al.*, 1980, Achievement Grouping for Math	
341	Starr, 1977, Modern Math Plus Drills	
343	Saunders-Harris & Yeany, 1981, 7th Grade Science Study II	
346	Cohen & Walsh, 1980, Individualized Geometry	
347	Downes, *et al.*, 1978, 76 Questions	
349	Horak, 1981, Mathematics Meta-Analysis	

INTERMEDIATE LEVEL MATHEMATICS AND SCIENCE
Decision Display
#2

Restatement of issue as a hypothesis:

The instructional approaches known as direct instruction and mastery learning are more effective than other approaches in promoting the mathematics and science achievement and retention of intermediate level students; these approaches also foster positive student attitudes.

Item Number	Short Title	Quality of Rating of Study (5=High)
Items which tend to support hypothesis:		
351	Driscoll, 1980, Research Within Reach-Math	[5] (studies generally support)
297	Burrows & Okey, 1975, 4th and 5th Grade Geometry Study	[4]
347	Downes, *et al*., 1978, 76 Questions	[4] (studies generally support)
336	Ebmeier & Good, 1979, Effects of Inservice	[4]
323	Emmer, 1981, Jr. High Math Study	[4]
338	Madike, 1980, Microteaching Study	[4]
292	Ward, 1979, Australian Math Study	[4]
327	Daruwalla, 1979, Newspaper in Math Instruction	[3]
324	Fisher, 1981, Remedial Math	[3]
350	Gershman & Sakamoto, 1980, Intermediate CAI	[3]
333	Haertel, 1978, NSF Review	[3] (for mathematics)
325	Miller, 1981, Science Teaching Behaviors	[3]
330	SEDL Rx, 1979, R&D Speaks in Math	[3] (studies generally support)
332	Saunders & Yeany, 1979, 7th Grade Science Study	[3]
147	Carnahan, 1980, Teacher Planning	[2]
341	Starr, 1977, Modern Math Plus Drills	[2]
Items which tend to deny hypothesis:		
300	Taylor, 1975, Adaptive Mastery	[4]
333	Haertel, 1978, NSF Review	[3] (for science)

Item Number	Short Title	Quality of Rating of Study (5=High)
Items which are inconclusive regarding the hypothesis:		
	None.	
Items which were excluded because they were weak:		
	None.	
Items which were excluded because they were judged to be irrelevant to this hypothesis:		
3	Rogosta, *et al.*, Computer-Assisted Instruction Longitudinal Study	
100	Moody, *et al.*, 1972, Class Size/Math	
133	Anderson, n.d., Task Behavior and Achievement	
146	Deady, 1969, Science Achievement & Attitudes	
187	Brown & Wunderlich, 1976, Open Education & Ability Grouping	
191	Hirsch, 1976, Math Research Review	
192	Brassell, *et al.*, 1980, Math Achievement and Attitude	
204	Dewar, 1963, Sixth Grade Ability Grouping	
205	Plewes, 1979, Mixed Ability Teaching	
206	Gabel & Herron, 1977, Effects of Grouping and Pacing	
207	Provus, 1960, Homewood Grouping Study	
326	Szetela, 1981, Calculator Study	
328	Daume, 1980, Science Content and Process	
329	Peterson, *et al.*, 1980, Large and Small Group Math	
334	Lysiak, *et al.*, 1976, Title I CAI	
335	Yoshida, 1980, Effects of Drill Practice	
337	Dekkers, 1979, FAST and Student Preferences	
339	Madike, 1980, Microteaching & Achievement	
340	Bright, *et al.*, 1980, Achievement Grouping for Math	
342	Cooney, *et al.*, 1981, Two Strategies/Two Skills	
343	Saunders-Harris & Yeany, 1981, 7th Grade Science Study II	
344	Wollman & Lawson, 1978, Proportional Reasoning Study	
345	McMillan & May, 1979, Student Attitudes Toward Science	
346	Cohen & Walsh, 1980, Individualized Geometry	
348	O'Sullivan, *et al.*, 1981, Science Teacher Inservice	
349	Horak, 1981, Mathematics Meta-Analysis	

INTERMEDIATE LEVEL MATHEMATICS AND SCIENCE
Decision Display
#3

Restatement of issue as a hypothesis:

Intermediate level mathematics and science instruction which includes at least some degree of individualization confers greater achievement and retention benefits than does instruction with no individualization.

Items which tend to support hypothesis:

Item Number	Short Title	Quality of Rating of Study (5=High)
351	Driscoll, 1980, Research Within Reach-Math	[5] (studies generally support)
206	Gabel & Herron, 1977, Effects of Grouping and Pacing	[4]
349	Horak, 1981, Mathematics Meta-Analysis	[4]
324	Fisher, 1981, Remedial Math	[3]
350	Gershman & Sakamoto, 1980, Intermediate CAI	[3]
333	Haertel, 1978, NSF Review	[3] (studies generally support)
191	Hirsch, 1976, Math Research Review	[3]
100	Moody, et al., 1972, Class Size/Math	[3]
3	Ragosta, et al., 1980, Computer-Assisted Instruction Longitudinal Study	[3]
335	Yoshida, 1980, Effects of Drill Practice	[3]

Items which tend to deny hypothesis:

Item Number	Short Title	Quality of Rating of Study (5=High)
346	Cohen & Walsh, 1980, Individualized Geometry	[4]

Items which are inconclusive regarding the hypothesis:

None.

Item Number	Short Title	Quality of Rating of Study (5=High)
	Items which were excluded because they were weak:	
	None.	
	Items which were excluded because they were judged to be irrelevant to this hypothesis:	
133	Anderson, n.d., Task Behavior and Achievement	
146	Deady, 1969, Science Achievement & Attitudes	
147	Carnahan, 1980, Teacher Planning	
187	Brown & Wunderlich, 1976, Open Education & Ability Grouping	
192	Brassell, *et al.*, 1980, Math Achievement and Attitude	
204	Dewar, 1963, Sixth Grade Ability Grouping	
205	Plewes, 1979, Mixed Ability Teaching	
207	Provus, 1960, Homewood Grouping Study	
292	Ward, 1979, Australian Math Study	
297	Burrow & Okey, 1975, 4th and 5th Grade Geometry Study	
300	Taylor, 1975, Adaptive Mastery	
323	Emmer, 1981, Jr. High Math Study	
325	Miller, 1981, Science Teaching Behaviors	
326	Szetela, 1981, Calculator Study	
327	Daruwalla, 1979, Newspaper in Math Instruction	
328	Daume, 1980, Science Content and Process	
329	Peterson, *et al.*, 1980, Large and Small Group Math	
330	SEDL Rx, 1979, R&D Speaks in Math	
331	Nivette, 1979, Math and Reading Evaluation	
332	Saunders & Yeany, 1979, 7th Grade Science Study	
334	Lysiak, *et al.*, 1976, Title I CAI	
336	Ebmeier & Good, 1979, Effects of Inservice	
337	Dekkers, 1979, FAST and Student Preferences	
338	Madike, 1980, Microteaching Study	
339	Madike, 1980, Microteaching & Achievement	
340	Bright, *et al.*, 1980, Achievement Grouping for Math	
341	Starr, 1977, Modern Math Plus Drills	
342	Cooney, *et al.*, 1981, Two Strategies/Two Skills	
343	Saunders-Harris & Yeany, 1981, 7th Grade Science Study II	
344	Wooman & Lawson, 1978, Proportional Reasoning Study	
345	McMillan & May, 1979, Student Attitudes Toward Science	
347	Downes, *et al.*, 1978, 76 Questions	
348	O'Sullivan, *et al.*, 1981, Science Teacher Inservice	

INTERMEDIATE LEVEL MATHEMATICS AND SCIENCE
Decision Display
#4

Restatement of issue as a hypothesis:

No one organizational/grouping pattern is inherently superior to others for instructing intermediate level students in science and mathematics.

Item Number	Short Title	Quality of Rating of Study (5=High)	
Items which tend to support hypothesis:			
351	Driscoll, 1980, Research Within Reach-Math	[5]	(studies generally support)
187	Brown & Wunderlich, 1976, Open Education & Ability Grouping	[4]	
347	Downes, et al., 1978, 76 Questions	[4]	(studies generally support)
206	Gabel & Herron, 1977, Effects of Grouping and Pacing	[4]	
340	Bright, et al., 1980, Achievement Grouping for Math	[3]	
204	Dewar, 1963, Sixth Grade Ability Grouping	[3]	
333	Haertel, 1978, NSF Review	[3]	(studies generally support)
191	Hirsch, 1976, Math Research Review	[3]	(studies generally support)
325	Miller, 1981, Science Teaching Behaviors	[3]	
329	Peterson, et al., 1980, Large and Small Group Math	[3]	
207	Provus, 1960, Homewood Grouping Study	[3]	
147	Carnahan, 1980, Teacher Planning	[2]	
146	Deady, 1969, Science Achievement & Attitudes	[2]	
Items which tend to deny hypothesis:			
192	Brassell, et al., 1980, Math Achievement & Attitude	[3]	
100	Moody, et al., 1972, Class Size/Math	[3]	
205	Plewes, 1979, Mixed Ability Teaching	[3]	

Item Number	Short Title	Quality of Rating of Study (5=High)
	Items which are inconclusive regarding the hypothesis:	
	None.	
	Items which were excluded because they were weak:	
	None.	
	Items which were excluded because they were judged to be irrelevant to this hypothesis:	
3	Rogosta, *et al.*, Computer-Assisted Instruction Longitudinal Study	
133	Anderson, n.d., Task Behavior and Achievement	
292	Ward, 1979, Australian Math Study	
297	Burrows & Okey, 1975, 4th and 5th Grade Geometry Study	
300	Taylor, 1975, Adaptive Mastery	
323	Emmer, 1981, Jr. High Math Study	
324	Fisher, 1981, Remedial Math	
326	Szetela, 1981, Calculator Study	
327	Daruwalla, 1979, Newspaper in Math Instruction	
328	Daume, 1980, Science Content and Process	
330	SEDL Rx, 1979, R&D Speaks in Math	
331	Nivette, 1979, Math and Reading Evaluation	
332	Saunders & Yeany, 1979, 7th Grade Science Study	
334	Lysiak, *et al.*, 1976, Title I CAI	
335	Yoshida, 1980, Effects of Drill Practice	
336	Ebmeier & Good, 1979, Effects of Inservice	
337	Dekkers, 1979, FAST and Student Preferences	
338	Madike, 1980, Microteaching Study	
339	Madike, 1980, Microteaching & Achievement	
341	Starr, 1977, Modern Math Plus Drills	
342	Cooney, *et al.*, 1981, Two Strategies/Two Skills	
343	Saunders-Harris & Yeany, 1981, 7th Grade Science Study II	
344	Wollman & Lawson, 1978, Proportional Reasoning Study	
345	McMillan & May, 1979, Student Attitudes Toward Science	
346	Cohen & Walsh, 1980, Individualized Geometry	
348	O'Sullivan, *et al.*, 1981, Science Teacher Inservice	
349	Horak, 1981, Mathematics Meta-Analysis	
350	Gershman & Sakamoto, 1980, Intermediate CAI	

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Item No. — Citation

133 Anderson, L. W. *A measure of student involvement in learning: Time on-task*. Columbia: University of South Carolina (no date). (ERIC/EDRS No. ED 110 504)

192 Brassell, A., Petry, S. & Brooks, D. M. Ability grouping, mathematics achievement and pupil attitudes toward mathematics. *Journal for Research in Mathematics Education*, 1980, *11*, 22-28.

340 Bright, G. W., Harvey, J. G., & Wheeler, M. M. Achievement grouping with mathematics concept and skill games. *Journal of Educational Research*, 1980, *73*, 265-269.

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297 Burrows, C. K., & Okey, J. R. *The effects of a mastery learning strategy on achievement*. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, D.C., March-April, 1975. (ERIC/EDRS No. ED 109 240)

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346 Cohen, M. P., & Walsh, M., Sr. The effects of individualized instruction on learning and retention of a geometry unit in junior high school. *International Journal of Mathematical Education in Science and Technology*, 1980, *11*, 41-44.

342 Cooney, T. J., Hirstein, J. J., & Davis, E. J. The effects of two strategies for teaching two mathematical skills. *Journal for Research in Mathematics Education*, 1981, *12*, 220-225.

327 Daruwalla, A. N. *The effectiveness of the newspaper as an instructional tool to teach seventh grade mathematics classes*. Memphis, TN: Memphis State University, 1979. (ERIC/EDRS No. ED 199 046)

328 Daume, R. J. *Effects of type of junior high school science program on science content achievement and science process achievement*. Paper presented at the meeting of the Mid-South Educational Association, 1980. (ERIC/EDRS No. ED 199 040)

Item No.	Citation
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204	Dewar, J. A. Grouping for arithmetic instruction in sixth grade. *Elementary School Journal*, 1963, *63*, 266-269.
351	Driscoll, M. *Research within reach: Elementary school mathematics*. St. Louis, MO: Research and Development Interpretation Service, CEMREL, Inc., 1980.
347	Downes, J. P., *et al*., *76 questions: A synthesis of the research on teaching and learning mathematics*. Atlanta, GA: Georgia State Department of Education, Office of Instructional Services, 1978. (ERIC/EDRS No. ED 162 896)
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345	McMillan, J. H., & May, M. J. A study of factors influencing attitudes toward science of junior high school students. Journal of Research in Science Teaching, 1979, 16, 217-222.
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100	Moody, W. B., Bausell, R. B., and Jenkins, J. R. The effect of class size on the learning of mathematics: A parametric study. Paper presented at the Annual Meeting of the American Educational Research Association, 1972. (ERIC/EDRS No. ED 062 138)
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348	O'Sullivan, P. S., Piper, M. K., & Carbonari, J. P. A model for the effect of an inservice program on junior high school science achievement. Journal of Research in Science Teaching, 1981, 18, 199-207.
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343	Saunders-Harris, R., & Yeany, R. H. Diagnosis, remediation, and locus of control: Effects on immediate and retained achievement and attitudes. *Journal of Experimental Education*, 1981, *49*, 220-224.
341	Starr, R. J. Modern math plus computational drills: Affective and cognitive results. *School Science and Mathematics*, 1977, *77*, 701-604.
326	Szetela, W. *The effects of using hand calculators in the learning of mathematics in grades three to eight*. Vancouver, BC: Educational Research Institute of British Columbia, 1981. (ERIC/EDRS No. 201 502)
300	Taylor, S. S. *The effects of mastery, adaptive mastery, and non-mastery models on the learning of a mathematical task*. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, D.C., March-April 1975. (ERIC/EDRS No. ED 106 145)
292	Ward, G. *Learning time and teaching for mastery*. Occasional paper No. 15. Hawthorn, Victoria, Australia: Australian Council for Educational Research, August 1979. (ERIC/EDRS No. ED 183 596)
344	Wollman, W. T., & Lawson, A. E. The influence of instruction on proportional reasoning in seventh graders. *Journal of Research in Science Teaching*, 1978, *15*, 227-232.
335	Yoshida, H. Effects of drill practice on aptitude in the learning of mathematics. *Journal of Educational Psychology*, 1980, *72*, 706-715.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 3 LOCATION: NWREL Information Center

REVIEWER: P. Rapaport DATE REVIEWED: November 1980

CITATION: Ragosta, M., Jamison, D. T., Juhnke, W., Woodson, R. and Holland, P. W. Computer-assisted instruction: a longitudinal study. Paper presented at the Annual Meeting of the American Educational Research Association, Boston, April 1980. (From Wilson 1980)

DESCRIPTORS: Media, Computer-Assisted Instruction, Mathematics, Intermediate Grades

SHORT TITLE: Ragosta, et al., 1980, Computer-Assisted Instruction Longitudinal Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

Insufficient details were given in this secondary source to fully judge the quality of the study.

SYNOPSIS:

Supplementary CAI instruction was given using the Computer Curriculum Corporation (CCC) for fourth-sixth grades in mathematics, reading and language. All students were pretested at the beginning of fourth grade and posttested at the end of sixth grade. CAI students received three drill and practice applications from the CCC. Not all groups received all three topics. The control group did not receive any CAI. It is not clear from the description whether different groups received all possible permutations of treatments or how many students were tested.

ITEM NUMBER: 3 **SHORT TITLE:** Ragosta, et al., 1980, Computer-Assisted Instruction Longitudinal Study

RESEARCHER'S FINDINGS:

Students who used all three curricula scored significantly higher gains on vocabulary subtest of the California Test of Basic Skills vs. the control group. Those who worked with CAI mathematics but not the other two scored lower on a reading test than students who received CAI in reading and language arts. The reading and language arts curricula had more effect on language arts scores than on reading scores.

RESEARCHER'S CONCLUSIONS:

None drawn.

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 100　　LOCATION: NWREL Info. Center/Microfiche

REVIEWER: P. Rapaport　　DATE REVIEWED: December 1980

CITATION: Moody, W. B., Bausell, R. B., and Jenkins, J. R. The effect of class size on the learning of mathematics: A parametric study. Paper presented at the Annual Meeting of the American Educational Research Association, 1972. (ERIC/EDRS No. ED 062 138)

DESCRIPTORS: Class Size, Mathematics, Intermediate Grades

SHORT TITLE: Moody, et al., 1972, Class Size/Math

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSES

PRIMARY SOURCE X　　SECONDARY SOURCE ___　　DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1　2　[3]　4　5 (Strong)

BRIEF DISCUSSION OF RATING:

No control group; instructional methods may have influenced findings.

SYNOPSIS:

The subjects were 249 fourth grade students in three public schools in Northern Delaware. The teachers were 17 undergraduate junior and senior level elementary education majors who volunteered to participate. The study was conducted over a three-day period, and 14 of the teachers participated for only one day. Two teachers participated for two days in two schools. The last teacher participated in all three schools on different days. Within each school, Group 1-1 consisted of 20 students who received individual instruction. Group 1-2 consisted of 20 students who received lessons two at a time. Group 1-5 consisted of 20 students who received lessons five at a time. Group 1-23 consisted of a group of 23 students who all received the lesson together. Students were randomly assigned to groups, and within each school, teachers were randomly assigned to groups with the following constraints: no teacher was assigned to teach more than one group with five or more students, all teachers were assigned to at least one 1-2 group, and all teachers were assigned to at least two 1-1 students. Instructional order was randomly assigned except for constraints caused by the availability of only one room big enough for groups of five or more. All subjects scored five or less on a pretest covering the ten topics to be covered in the lesson. All subjects received exactly 30 minutes of instruction. The test contained 20 questions, two on each topic.

RESEARCHER'S FINDINGS:

Students who received individual instruction had higher test scores than those who received instruction in groups of two or five. The scores of students who were instructed in twos or fives were approximately the same and were superior to those instructed in a group of 23.

RESEARCHER'S CONCLUSIONS:

"An empircal rationale is supplied for small group remedial instruction in those cases in which additional personnel are available to supplement the instruction of the classroom teacher. Examination of the means of the four groups, however, clearly indicate that although small group instruction is incremental when compared to large group instruction, large group instruction is much more efficient in terms of total learning produced. For this reason it is tempting to suggest that personnel such as teacher aides might be efficaciously employed to instruct small groups of academically needy students at the same time that the regular classroom teacher instructs the remaining students."

REVIEWER'S NOTES AND COMMENTS:

A description of the study's method, findings and conclusion may be found in the Class Size backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 133 LOCATION: NWREL Info. Center/Microfiche

REVIEWER: K. Cotton DATE REVIEWED: January 1981

CITATION: Anderson, L. W. A measure of student involvement in learning: Time on-task. Columbia: University of South Carolina (no date). (ERIC/EDRS No. ED 110 504)

DESCRIPTORS: Time Factors (Learning), Mathematics, Intermediate Grades

SHORT TITLE: Anderson, n.d., Task Behavior and Achievement

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSES

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

Although the main purpose of this study was to develop an instrument, the findings are relevant to purposes of the present review.

SYNOPSIS:

This study was designed to: (1) test the validity of techniques and instruments for measuring student task behavior, and (2) to examine the relationship between both overt and covert student task behavior and achievement.

Observers recorded the task behaviors of 177 junior high mathematics students in three classes--arithmetic, algebra and matrix arithmetic. The classes required different kinds of task behaviors (e.g., performing seatwork or attending a lecture), and observers utilized techniques for measuring both overt and covert student behavior. (Overt behavior was measured by means of an observer recording whether the student appeared to be on task; covert behavior was measured by querying the student about his or her thoughts at particular moments during the class period.)

ITEM NUMBER: 133 **SHORT TITLE:** Anderson, n.d., Task Behavior and Achievement

RESEARCHER'S FINDINGS:

A positive relationship between time-on-task and achievement was noted for all three classes and for both seatwork and lecture activities.

An overall time-on-task rating was arrived at by combining a student's overt and covert task behaviors. There was a positive relationship between covert behavior and achievement; the relationship between overt task behavior and achievement ranged from unclear to very high, depending on the kind of task; the composite time-on-task measure was a far better predictor of achievement than either the overt or the covert measure by itself.

RESEARCHER'S CONCLUSIONS:

A multiple measure of student task behaviors, i.e., one which measures both overt and covert behaviors, is superior to techniques which measure only overt or covert behavior.

The lack of a valid multiple measure may be the reason that little research has been conducted on the student behavior-student learning relationship.

REVIEWER'S NOTES AND COMMENTS:

A description of the instruments, the method and the major findings may be found in the backup file on Time Factors (Learning).

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 146 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: February 1981

CITATION: Deady, G. M. The effects of an increased time allotment on student attitudes and achievement in science. Doctoral dissertation, University of California-Berkley, 1969.

DESCRIPTORS: Time Factors (Learning), Science, Intermediate Grades

SHORT TITLE: Deady, 1969, Science Achievement & Attitudes

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSES

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT X

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 [2] 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

The duration of the experiment is unknown.

SYNOPSIS:

This study investigated: (1) whether increased time allotment increases student achievement in science; (2) whether the teacher's preference for a particular time allotment for science instruction affects student achievement in science; and (3) whether teacher preference for a particular time allotment for science instruction affects student attitudes toward science.

A total of 324 control and experimental students in grade 4 participated. Data on teacher time allotment preferences were gathered, assignments to time allotment groups were made and students were pre- and posttested.

ITEM NUMBER: 146 **SHORT TITLE:** Deady, 1969, Science Achievement & Attitudes

RESEARCHER'S FINDINGS:

No significant differences could be attributed to the treatment variable or the teacher preferences variable when examined across experimental groups, both sexes, IQs, or reading groups.

RESEARCHER'S CONCLUSIONS:

None

REVIEWER'S NOTES AND COMMENTS:

The abstract may be found in the backup file on Time Factors (Learning).

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 147 LOCATION: Audit & Evaluation Program

REVIEWER: K. Cotton DATE REVIEWED: February 1981

CITATION: Carnahan, R. S. The effects of teacher planning on classroom processes. Technical Report No. 541, Madison: Wisconsin R&D Center for Individualized Schooling, May 1980.

DESCRIPTORS: Time Factors (Learning), Mathematics, Intermediate Grades

SHORT TITLE: Carnahan, 1980, Teacher Planning

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSES

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 [2] 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

Teachers were the unit of analysis for part of this study and there were only nine of them. Moreover, it is likely that the kinds of information presented by the researchers was accessed by non-treatment and partial-treatment teachers via other means. Also, factors such as "teacher planning quality" and "teacher clarity" were defined narrowly and somewhat eccentrically.

SYNOPSIS:

This study had two major purposes: (1) to determine whether providing teachers with information on student aptitude and motivation strategies would affect the quality of teacher-written planning in elementary mathematics classes; and (2) to determine the relationship of written planning quality to the quality of classroom interactive and organizational environments. Nine 5th grade math teachers and their classes were arranged in groups in which the teachers were given aptitude information, aptitude information plus motivation information, or neither. Observers assessed teacher clarity, motivation strategy use and level of student engagement. Student outcomes measured included perceived teacher clarity, attitude toward math, and achievement.

ITEM NUMBER: 147 SHORT TITLE: Carnahan, 1980, Teacher Planning

RESEARCHER'S FINDINGS:

Major findings were that: (1) there was no treatment effect on the quality of written planning done; (2) written planning was not related to motivation strategy or perceived teacher clarity; and (3) student engaged time was not related to motivation strategy, but was related to observed and student-perceived teacher clarity.

Although the engaged time/student achievement relationship was treated as a "secondary question" in this study, it was found that "there was a positive, significant relationship between student engaged time and student achievement."

RESEARCHER'S CONCLUSIONS:

"The data suggest that planning is related to the classroom environment. ...using student background or aptitude information when planning might possibly allow for more effective adaptation of instruction to fit individual or small group needs. ...the results have implications when considered as helping teachers to become aware of how their planning and classroom behavior may effect (sic) the amount of time students actually spend working."

REVIEWER'S NOTES AND COMMENTS:

The technical report may be found in the backup file on Time Factors (Learning).

ITEM NUMBER: 187 LOCATION: NWREL Info. Center/Microfiche

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Brown, S. W. & Wunderlich, D. W. The effect of open concept education and ability grouping on achievement level concerning the teaching of fifth grade mathematics. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA, April 1976. (ERIC/EDRS No. ED 128 197)

DESCRIPTORS: Ability Grouping, Mathematics, Intermediate Grades

SHORT TITLE: Brown & Wunderlich, 1976, Open Education & Ability Grouping

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a well-designed and conducted study.

SYNOPSIS:

The purpose of this study was to determine if open education and grouping students according to ability would result in greater achievement in mathematics than might occur in a heterogeneous, self-contained classroom. One hundred twenty-five fifth grade math students received mathematics instruction in four different kinds of settings: (1) ability grouped/open environment/team teaching; (2) heterogeneous/open environment/team teaching; (3) homogeneous/self-contained classroom/single teacher; and (4) heterogeneous/self-contained/single teacher. Each class was observed four times and information about the learning environment was recorded. Student perceptions of the learning environment were also gathered. SRA math achievement tests were administered, initially to group the students in the homogeneous classes, and later to determine the achievement gains of students in the different instructional settings.

ITEM NUMBER: 187 **SHORT TITLE:** Brown & Wunderlich, 1976, Open Education & Ability Grouping

RESEARCHER'S FINDINGS:

Results indicated no significant differences among groups on math achievement. A small difference was observed in favor of those classes which were not team taught.

As concerns the learning environment, the data indicated that there was a higher satisfaction level and greater cohesiveness, in the heterogeneous classes. The ability grouped classes and the team taught classes evidenced greater friction than other classes. No differences were noted as regards the degree of competition.

RESEARCHER'S CONCLUSIONS:

"The effect of ability grouping and of team-teaching on mathematics achievement remains inconclusive. The finding that single teacher units result in greater computational skill for students may be an indication of more drill and practice activities in this type of setting than in the team taught setting.

"The students' perceptions of the learning environment uncovered a more concise body of evidence for heterogeneous grouping."

REVIEWER'S NOTES AND COMMENTS:

None

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 191 LOCATION: RSE Project Files

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Hirsch, C. R. A review of research on individualized instruction in secondary mathematics. School Science and Mathematics, 1976, 76, 499-507.

DESCRIPTORS: Group Size, Mathematics, Intermediate Grades

SHORT TITLE: Hirsch, 1976, Math Research Review

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a good review and includes a set of tables which summarize the studies examined.

SYNOPSIS:

This is a review of: (1) 33 studies in which individualized instruction and group instructional methods were compared in terms of learning gains produced; and (2) 19 studies in which the attitudes toward math of students in the two instructional settings were compared. Some of these studies also examined the individualized approach in relation to learner characteristics, and two compared teaching methods utilized within the two instructional approaches.

ITEM NUMBER: 191 SHORT TITLE: Hirsch, 1976, Math Research Review

RESEARCHER'S FINDINGS:

Learning Gains: Five of the 33 studies reviewed reported significant math learning gains in favor of individualized instruction, four reported significant gains in favor of group-based instruction, and 24 found no statistically significant differences.

Attitudes: Sixteen (of 19) studies reported no significant differences in attitude toward math on the part of students receiving the two types of instruction. Three found more positive attitudes on the part of students receiving individualized instruction.

Student Characteristics: The researchers examined a variety of different student characteristics-instructional approach relationships. Findings concerning ability, learning rate, self-esteem, etc., were mixed and do not lead to generalizable statements.

Teaching Methods: One (of 2) studies found no differences in teaching methods in individualized vs. group instruction. The other found that teachers using the individualized approach spent more out-of-class preparation time.

RESEARCHER'S CONCLUSIONS:

The conclusions are in the form of recommendations for future research:

1. Longitudinal studies should be undertaken to determine the effects of individualized vs. group instruction on learning and attitude of students.
2. Future research should consider the effect of aptitude variables.
3. Transfer-of-learning should also be considered.
4. The effects of individualized instruction on problem-solving and long-term retention should be investigated.
5. The role of the teacher in individualized instruction warrants investigation.
6. The effect of individualized instruction upon the individual learner warrants consideration.

REVIEWER'S NOTES AND COMMENTS:

A copy of the review may be found in the backup file on Group Size.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 192 LOCATION: RSE Project Files

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Brassell, A., Petry, S. & Brooks, D. M. Ability grouping, mathematics achievement and pupil attitudes toward mathematics. Journal for Research in Mathematics Education, 1980, 11, 22-28.

DESCRIPTORS: Ability Grouping, Mathematics, Intermediate Grades

SHORT TITLE: Brassell, et al., 1980, Math Achievement and Attitude

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was carefully structured and carried out.

SYNOPSIS:

This study was designed to determine what relationships exist (1) between student attitude toward mathematics and student placement in an ability grouping hierarchy; and (2) between student attitude toward math and student achievement in math. The Mathematics Attitude Inventory (MAI) was administered to 714 seventh graders in five junior high schools. Student math achievement data were analyzed in relation to attitude and in relation to students' placement in the schools' ability grouping structures. The study looked at both the student's ability group (low, medium, high) and at his/her ability relative to others in the same ability group. The MAI provided student attitude data in six areas: attitude toward teacher, feelings about the value of mathematics in society, anxiety toward mathematics, self-concept regarding mathematics, enjoyment of mathematics and mathematics motivation.

ITEM NUMBER: 192 **SHORT TITLE:** Brassell, et al., 1980, Math Achievement and Attitude

RESEARCHER'S FINDINGS:

Students in the highest ability group (of 3) had the best attitudes toward math. Student math achievement scores were related to ability grouping (highest ability group had highest scores, etc.). Students of high ability relative to others in the same ability group had much more positive attitudes than those whose ability was low relative to others in their group, especially as regards self-concept vis-a-vis mathematics. Low-ability students within each group were also found to have more anxiety about mathematics performance.

RESEARCHER'S CONCLUSIONS:

"Mathematics self-concept and mathematics anxiety appear to be important correlates of mathematics achievement. The implications of these findings suggest that teachers must attend to self-concept enhancement and anxiety in mathematics contexts."

The authors suggest that special attention be given to students in the middle group and especially those at the lower end of this group, as they were found to have the lowest self-concepts and highest anxiety. As these students are less likely than very high- or low-ability students to receive extra help within many school structures, special efforts should be made to help them. Teachers should be aware that student attitudes toward teachers are an important feature of all-over student attitude toward math.

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file on Ability Grouping.

While these researchers accept ability grouping as a fact of life rather than arguing for another alternative, they do acknowledge that certain ability group placements seem to affect students adversely and suggest various ways that these negative effects might be mitigated.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 204 LOCATION: RSE Project Files

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Dewar, J. A. Grouping for arithmetic instruction in sixth grade. Elementary School Journal, 1963, 63, 266-269.

DESCRIPTORS: Ability Grouping, Mathematics, Intermediate Grades

SHORT TITLE: Dewar, 1963, Sixth Grade Ability Grouping

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well-executed.

SYNOPSIS:

This study sought to determine whether pupils who received arithmetic instruction within a three-group ability grouping structure would show significantly better achievement than those receiving instruction in a traditional, whole-class setting. Four experimental (homogeneously grouped) and four control (ungrouped) classes of sixth graders comprised the sample. The SAT arithmetic test results and teacher judgments were used to group experimental students, and students were posttested with an alternative form of the SAT arithmetic test. Teacher and student attitudes were gathered via a questionnaire. Control students were grouped for statistical analysis, though not for instruction.

ITEM NUMBER: 204   SHORT TITLE: Dewar, 1963, Sixth Grade Ability Grouping

RESEARCHER'S FINDINGS:

Experimental Group 1 (the high-ability group) and 3 (the low-ability group) gained significantly over control students. There was no significant difference between experimental and Control Group 2.

The results of the teacher opinionnaire indicated that the teachers could see more and better learning occurring among experimental students (especially Groups 1 and 3) and that the experimental students were more responsive to arithmetic instruction.

Only the experimental students completed the student opinionnaire, and their responses to receiving instruction in the homogeneous groups was extremely positive.

RESEARCHER'S CONCLUSIONS:

This study presents evidence that this type of organization may have value. Similar studies are needed to determine whether the value indicated by those results is valid.

REVIEWER'S NOTES AND COMMENTS:

A copy of the study may be found in the backup file on Ability Grouping.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 205 LOCATION: RSE Project Files

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Plewes, J. A. Mixed-ability teaching--a deterioration in performance. Journal of Research in Science, 1979, 16, 229-236.

DESCRIPTORS: Ability Grouping, Science, Intermediate Grades

SHORT TITLE: Plewes, 1979, Mixed Ability Teaching

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a well-designed and conducted study.

SYNOPSIS:

This study was designed to determine the relative effects of homogeneous and heterogeneous ability grouping on science achievement and student attitude and to find out whether the effects of grouping strategy are related to either teacher effectiveness or student ability. One-hundred sixty 11- and 12-year-old British students participated in the study during the 1974-75 school year. The study began with the students being divided into four mixed-ability tutorial groups. Two of the groups were then reordered into four homogeneous ability groups. Homogeneous and heterogeneous groups received instruction for half the school year and were then reordered again--the homogeneously grouped students were arranged heterogeneously and vice versa. Achievement and attitude data were gathered and data were analyzed to determine what relationships existed between grouping, on the one hand, and student ability and teacher effectiveness, on the other.

ITEM NUMBER: 205 SHORT TITLE: Plewes, 1979, Mixed Ability Teaching

RESEARCHER'S FINDINGS:

Achievement: Although some pupils performed better in the mixed-ability groups, the large majority improved their scores in the homogeneous groups. The order in which the students participatd in the two kinds of groups made no difference. There were no differences in comparative performance between the different levels of ability.

Attitude: Students overwhelmingly preferred working in the homogeneous groups.

In cases where the same teachers taught the same students in both settings, teacher performance with these students was superior in the homogeneous setting.

RESEARCHER'S CONCLUSIONS:

"It seems...that the greater stress and effort required to organize and teach mixed-ability classes do not reward the teacher with pupils who perform at a higher level. Maybe social and long-term educational advantages more than counteract this deterioration in immediate performance but these advantages need to be carefully defined, measured, and studied before moving over wholesale to mixed-ability methods.... A final point, which emerges clearly from this investigation, is that pupils themselves preferred being taught in groups ordered by ability and this may have an important effect on their performance. It has too easily been assumed in the past that pupils, especially of lower ability, would prefer the mixed-ability situation. This investigation throws doubts on this premise."

REVIEWER'S NOTES AND COMMENTS:

A copy of the report is in the Group Size backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 206 LOCATION: RSE Project Files

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Gabel, D. & Herron, J. D. The effects of grouping and pacing on learning rate, attitude and retention in ISCS Classrooms. Journal of Research in Science Teaching, 1977, 14, 385-399.

DESCRIPTORS: Ability Grouping, Group Size, Science, Intermediate Grades

SHORT TITLE: Gabel & Herron, 1977, Effects of Grouping and Pacing

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a carefully designed and conducted study.

SYNOPSIS:

This study was designed to determine the effects of different grouping and pacing arrangements on learning rate, retention and attitude. The subjects were 1,022 seventh grade students enrolled in Intermediate Science Curriculum Study (ISCS) programs in rural and urban schools. Students were given mental ability tests and then studied the ISCS materials (1) alone, (2) with a partner of similar ability or (3) with a partner of different ability; and either (1) with imposed deadlines or (2) self-paced. Chapter, unit and attitude tests were administered. Data for rural and urban students were analyzed separately.

ITEM NUMBER: 206 SHORT TITLE: Gabel & Herron, 1977, Effects of Grouping and Pacing

RESEARCHER'S FINDINGS:*

Learning Rate: Generally, city children who worked with a partner learned more rapidly than those who worked alone; for rural children the opposite was true. Kind of pacing had no effect on the learning rate of rural children, but for the urban children who worked alone, self-pacing increased their learning rate. This was especially true for low- and middle-ability children.

Retention: For both rural and urban children, retention was improved if learning was self-paced. Rural children who worked with a partner had better retention; there was no difference for urban children. There were virtually no differences in retention scores for self-paced students of the same mental ability whether students worked alone or with partners.

Attitude: All students had a favorable attitude toward the ISCS program, with urban children having the most favorable attitudes. There was no significant difference between the attitudes of children who had studied with deadlines or self-pacing, or between students who worked alone or with a partner.

RESEARCHER'S CONCLUSIONS:

High-ability students learn faster than low-ability students.

In general, students learn more effectively when they are allowed to pace themselves than when they are given deadlines, though there are some exceptions to this.

For low-ability students, working alone seems most beneficial to learning rate, but for some low-ability students working with a partner improved retention. Low-ability students appear to benefit from self-paced learning.

REVIEWER'S NOTES AND COMMENTS:

A copy of the report may be found in the backup files on Ability Grouping and on Group Size.

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*These are selected from the many pages of findings generated due to the study having so many cells.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 207 LOCATION: RSE Project Files

REVIEWER: K. Cotton DATE REVIEWED: April 1981

CITATION: Provus, M. M. Ability grouping in arithmetic. Elementary School Journal, 1960, 60, 391-398.

DESCRIPTORS: Ability Grouping, Mathematics, Intermediate Grades

SHORT TITLE: Provus, 1960, Homewood Grouping Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT ___ IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well-structured and conducted.

SYNOPSIS:

This study compared the effects of homogeneous and heterogeneous ability grouping on the arithmetic achievement of students in grades 4, 5 and 6. Nineteen classes participated, eight of which were heterogeneously grouped and eleven of which were grouped homogeneously. Students were pre- and posttested using arithmetic subtests of the Iowa Test of Basic Skills, the Metropolitan Achievement Test and measures of attitude toward mathematics. Teacher attitudes were also measured.

ITEM NUMBER: 207 SHORT TITLE: Provus, 1960, Homewood Grouping Study

RESEARCHER'S FINDINGS:

Comparing all homogeneously grouped students with all heterogeneously grouped students revealed significantly greater achievement growth on the part of the homogeneously grouped classes.

Comparing students by ability level revealed that homogeneously grouped high- and middle-ability students performed better than heterogeneously grouped students of similar ability levels. The heterogeneously grouped low-ability students, however, performed somewhat better than the low-ability homogeneously grouped students. The performance differences were statistically significant only for the high-ability group.

There were no significant attitude differences between homogeneously and heterogeneously grouped students.

There were no significant differences in teacher attitude regarding student progress, teaching satisfaction or responses to parent input. Teachers indicated a desire to continue the program of ability grouping, though some had reservations, such as fear of discipline problems with slow groups, fear that students might not be properly placed, etc.

RESEARCHER'S CONCLUSIONS:

Homogeneously grouped students were more familar with arithmetic concepts and many children so grouped were more familiar with arithmetic fundamentals.

"...the more competent pupils profited most from ability grouping. The average children may have profited slightly, and the slow learners may have profited no more from ability grouping than they would have from a heterogeneous class."

The attitude changes observed were unrelated to the kind of instructional setting.

For the most part, teachers supported the program, and all expressed a desire to teach homogeneous classes the following year.

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file on Ability Grouping.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 292 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: March 1982

CITATION: Ward, G. Learning time and teaching for mastery. Occasional paper No. 15. Hawthorn, Victoria, Australia: Australian Council for Educational Research, August 1979. (ERIC/EDRS No. ED 183 596)

DESCRIPTORS: Mastery Learning, Time Factors (Learning), Mathematics, Intermediate Grades

SHORT TITLE: Ward, 1979, Australian Math Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a well-designed and conducted small-scale study in which the findings of previous research are corroborated.

SYNOPSIS:

The purpose of this study was to investigate the effects of a mastery learning strategy on the required learning time, achievement and retention of students. Fifty-nine boys in grade 8 were divided into an experimental and a control group; each of these groups was subdivided into higher-ability and lower-ability students. All students studied three units of matrix algebra. Both experimental and control students read instructions, noted the time when they began working, studied at their own pace, responded to questions in the text, noted the time when they finished studying, and took a unit test. Control students then moved on to the next unit, while experimental students were required to restudy the material if they did not demonstrate mastery on the test. Tutoring was provided for students who did not achieve mastery after taking the test three times. Control students were required to restudy until mastery was achieved for Unit 3 only. All students took a summative test at the end of the three-unit instructional period and a retention test ten days later.

RESEARCHER'S FINDINGS:

The experimental group scored significantly higher than the control group on both the summative and retention tests. The treatment was equally effective for both ability levels.

Test scores of the experimental group increased over the sequence; those of the control group declined. The control group required more time to learn the third unit to mastery than did the experimental group. Treatment aided the learning efficiency (test scores/learning time) and the retention of low-ability students.

RESEARCHER'S CONCLUSIONS:

"The diagnostic review procedure resulted in progressively higher achievement scores over a series of hierarchical units and in higher summative and retention test scores; the efficiency of learning such units in terms of the mark per unit became greater across the sequence of units; the time spent in review declined across the units."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 297 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: March 1982

CITATION: Burrows, C. K., & Okey, J. R. The effects of a mastery learning strategy on achievement. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, D.C., March-April, 1975. (ERIC/EDRS No. ED 109 240)

DESCRIPTORS: Mastery Learning, Mathematics, Intermediate Grades

SHORT TITLE: Burrows & Okey, 1975, 4th & 5th Grade Geometry Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well-designed and conducted. Treatment differences were clearly specified and outcomes clearly displayed.

SYNOPSIS:

This study examined the effects of four different instructional treatments on the geometry achievement of intermediate level students. Eighty-four students from grades four and five were assigned to four groups and received instruction in 14 geometry skill areas. Group 1 received instruction from the 14 skill booklets on an individual basis. Teachers clarified terms, answered procedural questions and recorded student progress. Group 2 received the same instruction as Group 1, supplemented by stated performance objectives for each skill area. Group 3 received the same basic instruction as the first two groups, supplemented with sample test items for each skill. Students were instructed to study the sample test items. Group 4 was instructed as Group 3 was, but they also took a diagnostic test after studying each skill booklet, received them back quickly, and received additional instruction as needed until they demonstrated mastery. Instruction took place for 45 minutes daily over a 14-day period. All students were tested at the end of the 14-skill instructional series and again two weeks later.

ITEM NUMBER: 297 **SHORT TITLE:** Burrows & Okey, 1975, 4th and 5th Grade Geometry Study

RESEARCHER'S FINDINGS:

"...Group 4 (the mastery strategy) scored significantly higher than all other treatment groups. There were no significant differences in achievement among the first three groups... The same pattern of findings as on the posttest held for the retention test given two weeks later."

"Students of low mathematics aptitude who received the mastery treatment performed better (on the average) than high mathematics aptitude students in the control group... Fourth graders of low mathematics aptitude who received the mastery treatment scored as well on the posttest as fifth graders of high mathematics aptitude in the control group."

RESEARCHER'S CONCLUSIONS:

"Providing students with a combination of objectives, test items, diagnostic tests and remediation in conjunction with an individualized mathematics program significantly altered achievement. The effectiveness of the comprehensive mastery strategy was significantly greater than the use of the individual components of objectives, test items, or individualized materials. It was with low aptitude students that the mastery strategy was especially beneficial."

"The findings strongly support Bloom's hypothesis that many students can achieve at high levels if instruction is organized appropriately... The results...support Collin's finding that a mastery strategy will have a pronounced effect on pupil achievement when compared to instruction with no (or limited) built-in provisions for diagnosis and remediation."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 300 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: March 1982

CITATION: Taylor, S. S. The effects of mastery, adaptive mastery, and non-mastery models on the learning of a mathematical task. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, D.C., March-April 1975. (ERIC/EDRS No. ED 106 145)

DESCRIPTORS: Mastery Learning, Time Factors (Learning), Mathematics, Intemediate Grades

SHORT TITLE: Taylor, 1975, Adaptive Mastery

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a good study, although the researcher did not address the fact that the non-mastery students did as well as either of the mastery groups.

SYNOPSIS:

This study compared the effects of computer-based instructional strategies on achievement and retention in basic mathematics skill areas. Fifty-one students in grade 7 were divided into three groups. One group was instructed with a "typical mastery learning model," which involved initial instruction, followed by a fixed amount of practice. Formative tests were given and appropriate correctives prescribed for each objective. Students took a summative test and a retention test. The second group was instructed with an "adaptive mastery learning model," which was similar to the first model, except that the amount of practice was varied according to each student's performance on the practice items. In this approach, practice, formative evaluation and remedial instruction were combined. The third group received instruction, practice and took a summative test. No formative evaluation was conducted and correctives were not provided. The study also examined the differential effects of two practice formats--"clustered," in which students received all practice items relating to one objective consecutively; and "mixed," in which students received all the practice items for several objectives mixed together.

ITEM NUMBER: 300 SHORT TITLE: Taylor, 1975, Adaptive Mastery

RESEARCHER'S FINDINGS:

There were no significant differences among groups either on the posttest or the retention test. The adaptive mastery strategy required less time than the other strategies to produce the same results. There were no differences in effects produced by the clustered and mixed practice formats.

RESEARCHER'S CONCLUSIONS:

"In summary, the results of the present study indicate that the adaptive mastery learning model produced the same high level of performance as the other two models, but required less time, fewer practice items, and minimized overpractice. In addition, the adaptive mastery learning model more readily adjusts to the difficulty of the objective. Thus, it was concluded that the use of student performance on practice items is an effective and efficient means of predicting mastery."

REVIEWER'S NOTES AND COMMENTS:

None.

ITEM NUMBER: 323 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Emmer, E. T. Effective management in junior high mathematics classrooms. Austin, TX: Research and Development Center for Teacher Education, Texas University, March 1981. (ERIC/EDRS No. ED 206 448)

DESCRIPTORS: Mathematics, Intermediate Grades, Teacher Behavior

SHORT TITLE: Emmer, 1981, Jr. High Math Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a well-done observational study which clearly correlates teacher behaviors with student outcomes.

SYNOPSIS:

This is a report of the mathematics subsample of the large-scale Junior High Classroom Organizational Study conducted by Texas R&D Center staff. In the math study 26 teachers of grades 7 and 8 were observed in order to gather data on effective and ineffective instructional and management techniques. Over the course of the school year, each teacher was observed approximately 20 times, with the most frequent observation taking place during the first three weeks of the school year. Data on student behavior were also gathered and recorded during observation periods. Teacher and student behavior were analyzed in relation to student achievement on a 78-item multiple choice test given at the end of the school year, and in relation to student attitude, as measured by a 15-item rating scale.

ITEM NUMBER: 323   SHORT TITLE: Emmer, 1981, Jr. High Math Study

RESEARCHER'S FINDINGS:

Teachers were divided into two groups--effective and ineffective managers--as determined through management criteria applied to their classroom behavior and through analysis of student achievement and attitude data.

The more effective managers emphasized preventive measures for handling inappropriate behavior, and were less likely to ignore such behavior when it occurred. These teachers were also more proactive in eliciting desired behavior.

The more effective teachers were better at communicating clearly and were more able to design instruction and to accommodate differences in student abilities. They were more open and receptive to student input.

The effective managers had a clear set of rules and procedures and enforced these consistently from the beginning of the school year.

RESEARCHER'S CONCLUSIONS

None drawn. The discussion of findings is followed by case study reports on two of the participating teachers.

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 324 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Fisher, M. A. A remedial math program in a secondary school.
Tampa, FL: Nova University, March 1981. (ERIC/EDRS No. ED 204 146)

DESCRIPTORS: Mathematics, Intermediate Grades, Inservice Teacher Education

SHORT TITLE: Fisher, 1981, Remedial Math

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a well-designed and evaluated practicum project.

SYNOPSIS:

This study was designed to determine the degree of academic improvement produced through implementation of a remedial mathematics program for seventh graders. Participants were 75 students whose test scores indicated a need for remedial instruction. These students received instruction in the Intuitive Math Program, a compensatory education program which involved: (1) a diagnostic/prescriptive teaching approach; (2) instruction which was directed toward the skills to be tested on the program's criterion referenced test; (3) emphasis on problem solving; and (4) instruction in test-taking skills. Program teachers participated in inservice sessions which familiarized them with the program and with additional resources to use during its operation. At the end of the school year criterion referenced tests were administered to all participating students.

ITEM NUMBER: 324 SHORT TITLE: Fisher, 1981, Remedial Math

RESEARCHER'S FINDINGS:

Eighty-seven percent of the participating students demonstrated mathematics achievement sufficiently high to enable them to leave the compensatory education program. All but three participants achieved the program objective of increasing their test scores by one month per month of instruction.

RESEARCHER'S CONCLUSIONS

"It is concluded that the Intuitive Math Program integrated with the Individual Approach is beneficial to students with basic mathematical problems."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 325 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Miller, P. A. *The effects of behavior model analysis on teachers' behaviors during science activity lessons*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching. Ellenville, NY: NARST, April 1981. (ERIC/EDRS No. ED 202 740)

DESCRIPTORS: Science, Teacher Behaviors

SHORT TITLE: Miller, 1981, Science Teaching Behaviors

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well done and convincingly demonstrates the relationship between specific teaching approaches and student achievement.

SYNOPSIS:

In this study the effects of teacher training strategies on teacher behavior during science activity lessons and on student achievement were investigated. Forty-three preservice teachers were divided into three groups. All groups received instruction in effective approaches to conducting science activity lessons. Two groups then viewed and analyzed videotaped model activity lessons using an observation scale developed for this study, and received additional instruction and materials regarding effective teaching methods. All participating teachers were observed while conducting science activity lessons and their teaching behaviors were recorded. The elementary, middle school and secondary students receiving instruction from these teachers were pre- and posttested with tests based on the lesson objectives.

Instructional content presented to experimental teachers included how to introduce a new science activity lesson, how to give directions clearly and logically, how to manage the use of laboratory equipment, how to manage classroom activities and how to summarize the lesson meaningfully.

ITEM NUMBER: 325 SHORT TITLE: Miller, 1981, Science Teaching Behaviors

RESEARCHER'S FINDINGS:

Experimental group teachers were found to display significantly more of the teaching behaviors demonstrated to be effective than did control teachers. Students of experimental teachers evidenced significantly higher achievement than those of control teachers.

RESEARCHER'S CONCLUSIONS

"This study offers empirical evidence to the trainers of preservice science teachers that model analysis training strategies can significantly influence the acquisition of teaching behaviors...positive correlations between...teaching behaviors and pupil achievement support [the appropriateness of the behaviors taught].

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 326 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Szetela, W. The effects of using hand calculators in the learning of mathematics in grades three to eight. Vancouver, BC: Educational Research Institute of British Columbia, 1981. (ERIC/EDRS No. 201 502)

DESCRIPTORS: Mathematics

SHORT TITLE: Szetela, 1981, Calculator Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well designed and carried out.

SYNOPSIS:

The study reported in this document involved providing mathematics instruction supplemented by calculators to 116 students in grades five, six and seven in order to determine the effects of such instruction on mathematics achievement. All students were given a pretest on computational skills, followed by an eight-week instructional period which included the use of calculators. Students were divided into two groups for the two-part posttest, with one group using calculators and one group using paper and pencil for part one, and then changing to the other computational mode for part two.

ITEM NUMBER: 326 SHORT TITLE: Szetela, 1981, Calculator Study

RESEARCHER'S FINDINGS:

Both groups of students performed equally well on most comparisons on the posttest whether they used calculators or paper and pencil to perform computations. The calculator mode was favored significantly in a few of the comparisons.

A parallel study by the same researcher, which is referenced but not detailed, involved students in grades 3, 5, 7 and 8. This study offers further evidence that calculator use does not impair students' ability to perform computations using paper and pencil.

RESEARCHER'S CONCLUSIONS

"This study, the comparison study, previous studies by the investigator, and studies in general provide not a shred of evidence that use of calculators has harmful effects, at least over short runs. More studies over long periods of time are needed as are studies in which curricula have been specially designed to fully exploit advantages provided by the tool that is so widely used in everyday life."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 327 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Daruwalla, A. N. The effectiveness of the newspaper as an instructional tool to teach seventh grade mathematics classes. Memphis, TN: Memphis State University, 1979. (ERIC/EDRS No. ED 199 046)

DESCRIPTORS: Mathematics, Intermediate Grades

SHORT TITLE: Daruwalla, 1979, Newspaper in Math Instruction

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well executed and supports the use of the newspaper as an instructional aid.

SYNOPSIS:

In this study each of three teachers taught one seventh grade mathematics class using the conventional textbook only, and a second class in which use of the textbook was supplemented by use of the newspaper. Instruction took place over a period of six weeks, during which teachers used "mathematics class cards" supplied by the local newspaper in their experimental classrooms. These cards outlined activities related to everyday items selected from the newspaper, together with instructions on how to conduct each skill-building activity. Instruction focused on fractions, decimals, averages and currency. The 157 participating students took a mathematics subtest of the Iowa Test of Basic Skills at the completion of instruction.

ITEM NUMBER: 327 SHORT TITLE: Daruwalla, 1979, Newspaper in Math Instruction

RESEARCHER'S FINDINGS:

Students receiving the newspaper supplemented instruction performed significantly better on the posttest than students receiving only the textbook instruction.

There were no significant achievement differences between males and females.

RESEARCHER'S CONCLUSIONS

"The findings from this study support the need to relate new concepts taught to the students' daily experiences...there is an important place for the newspaper in the school curriculum to teach abstract mathematical concepts."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 328 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Daume, R. J. Effects of type of junior high school science program on science content achievement and science process achievement. Paper presented at the meeting of the Mid-South Educational Association, 1980. (ERIC/EDRS No. ED 199 040)

DESCRIPTORS: Science, Intermediate Grades

SHORT TITLE: Daume, 1980, Science Content and Process

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 [2] 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

There is no indication of the relationship between the tests used and the content of the "traditional" programs.

SYNOPSIS:

This study compared the effects of traditional science instruction with those of the Intermediate Science Curriculum Study (ISCS), a junior high science program which gives special emphasis to the processes of scientific inquiry, as well as presenting the usual science course content for this level. The 100 subjects--50 ISCS and 50 who had received traditional instruction--were randomly selected from the population of science students in two junior high schools. All were ninth graders and had been taught by their respective types of programs for three consecutive years. Subjects completed a science subtest of the Comprehensive Test of Basic Skills and the SRA Achievement Series. Scores of ISCS students and control students were compared to determine their relative proficiency in science content and process.

ITEM NUMBER: 328 SHORT TITLE: Daume, 1980, Science Content and Process

RESEARCHER'S FINDINGS:

There were no significant differences between ISCS and traditionally instructed students in terms of achievement in science content achievement or science process achievement.

RESEARCHER'S CONCLUSIONS

"Within the context of this study, the type of science program seems to have a very small relationship to science content or science process achievement."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 329 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Peterson, P. L. et al., Individual characteristics and childrens' learning in large-group and small-group approaches: Study II. Report from the Project on Studies of Instructional Programming for the Individual Student. Madison, WI: Wisconscin University, R&D Center for Individualized Schooling, 1980. (ERIC/EDRS No. ED 196 558)

DESCRIPTORS: Mathematics, Intermediate Grades, Grouping (Instructional Purposes)

SHORT TITLE: Peterson, et al., 1980, Large and Small Group Math

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This small-scale study was well done, although, as the researchers noted, results were somewhat influenced by the same teachers' uses of different formats.

SYNOPSIS:

This study examined the relationship between instructional group size and student achievement, retention and attitudes. Ninety-three fourth and fifth graders in four classes were surveyed to determine their preferences for instructional group size. Half of the students who preferred small group instruction were placed in small group settings and half were placed in large group formats. Those who preferred large group instruction were similarly assigned. During the two-week instructional period classes were observed and teacher and student classroom behaviors were recorded. At the end of the instructional period students were tested for achievement in attitude toward the unit, and were later tested for retention.

ITEM NUMBER: 329 SHORT TITLE: Peterson, et al., 1980, Large and Small Group Math

RESEARCHER'S FINDINGS:

Both low- and high-ability students performed better in the small group format than in the large group format. Results were reversed for middle-ability children. Whether preference of instructional format was matched or mismatched with actual instructional format did not affect achievement, attitude or retention. On-task classroom behavior was observed more frequently among those students who were taught in accordance with their instructional format preferences.

RESEARCHER'S CONCLUSIONS

Conclusions have to do with the general phenomenon of aptitude-treatment effects.

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 330 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: R&D speaks in junior high school mathematics: A research seminar for practitioners. Dallas, Texas, August 1979. Austin, TX: Southeast Educational Development Laboratory, September 1979. (ERIC/EDRS No. ED 186 274)

DESCRIPTORS: Mathematics, Intermediate Grades

SHORT TITLE: SEDL Rx, 1979, R&D Speaks in Math

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a useful review of findings concerning math skills, subskills, problem areas and instructional aids.

SYNOPSIS:

This is the report of seminar activities sponsored by the Southwest Educational Development Laboratory. The portions of the report which are most relevant to project concerns are the research summaries prepared and presented by Dr. Marilyn Suydam and by Dr. Edmund Emmer. Dr. Suydam's paper reviewed the research on four isues in junior high mathematics instruction: math anxiety, diagnosis, remediation and problem solving. Dr. Emmer's paper reviews research on effective classroom management practices in junior high mathematics classes. As the latter has been described in another Item Report (No. 323), this abstract will focus on the findings summarized by Dr. Suydam.

ITEM NUMBER: 330   SHORT TITLE: SEDL Rx, 1979, R&D Speaks in Math

RESEARCHER'S FINDINGS:

Math Anxiety: Little well-designed research has been conducted on math anxiety. The small base of information which exists suggests that this condition can be reduced by clearly communicating to the student what is to be learned.

Diagnosis: Research indicates that the best process for diagnosing student weaknesses in mathematics involves error analysis, conducted through use of one or more of the following: standardized tests, interviews, teacher-made tests, analysis of daily work, observation of student behaviors or analysis of records.

Remediation: Studies show that successful remediation programs are those which are well-planned and continuous. Findings are unclear about the use of math labs for remediation. Use of manipulatable materials is not harmful and is effective with about one-half of students requiring remediation. Tutoring can be helpful but tutors--especially adult tutors--require training.

Problem Solving: Proven ways to enhance problem solving skills include: providing adequate time, teaching a variety of problem solving strategies, using sharply focused questions, matching the level of difficulty of problems to each student's ability level, using manipulatable materials, presenting a variety of kinds of problems, using "real-life" aids such as the newspaper, and teaching students to detect their own errors and correct them.

Research on the effects of calculators with students indicates that they can be helpful, but that teachers must exercise discretion in teaching students how and when to use them.

RESEARCHER'S CONCLUSIONS

None drawn.

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 331 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Nivette, J. D. Project R3 Mathematics Program-SB-90 Reading Program. Evaluation Summary, 1977-78. San Jose, CA: San Jose Unified School District, 1979. (ERIC/EDRS No. ED 183 380)

DESCRIPTORS: Mathematics, Reading, Jr. High Schools

SHORT TITLE: Nivette, 1979, Math and Reading Evaluation

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) [1] 2 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

SYNOPSIS:

This program appeared successful, but information on program content is too sparse to enable us to know how these successes were achieved. The evaluation involved no control group.

ITEM NUMBER: 331 SHORT TITLE: Nivette, 1979, Math and Reading Evaluation

RESEARCHER'S FINDINGS:

RESEARCHER'S CONCLUSIONS

REVIEWER'S NOTES AND COMMENTS:

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 332 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Saunders, R. L. & Yeany, R. H. The effects of diagnosis, remediation and locus of control on achievement, retention, and attitudes of middle school science students. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Atlanta, GA, March 1979. (ERIC/EDRS No. ED 174 404)

DESCRIPTORS: Science, Intermediate Grades, Mastery Learning

SHORT TITLE: Saunders & Yeany, 1979, 7th Grade Science Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was modest in scope, but convincingly demonstrated some advantages to the diagnostic/remedial approach for science instruction.

SYNOPSIS:

This study was designed to determine the effects of three levels of instruction on the science achievement, retention and attitudes of middle school children. Three classes of seventh graders each received one of three kinds of instruction for 55 minutes during each school day. Group 1, the control group, was given 27 objectives, followed by three weeks of instruction, the first summative test, two more weeks of instruction, and then the second summative test. Two weeks later a retention test was administered. Group 2 was similarly treated, except that diagnostic measures were administered following each set of five objectives. These measures were corrected and returned by the teacher. Students not mastering an objective took a second, parallel diagnostic measure. Group 3 received the same treatments as Group 2, except that students failing to master objectives on the first diagnostic measure received remedial assignments to complete before taking the second diagnostic measure. Attitude measures were administered. Data produced from these activities were analyzed in relation to student race and locus of control "type" as determined from additional measures administered.

ITEM NUMBER: 332 **SHORT TITLE:** Saunders & Yeany, 1979, 7th Grade Science Study

RESEARCHER'S FINDINGS:

There were no significant summative achievement differences attributed to treatment approach or to locus of control type. Both diagnosis-only and diagnosis/remediation students (Groups 2 and 3) had significantly higher retention scores than control students. Internal locus of control (LOC) students retained more than external LOC students, and white students retained significantly more than black students. All students in the study had positive attitudes; there were no significant differences among the groups on attitude measures.

RESEARCHER'S CONCLUSIONS

"The use of diagnostic-prescriptive teaching method can...lead to two benefits: (1) an increase in students' retained achievement, and (2) the development of a system and materials that will lead to an increase in teacher efficacy."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 333 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Haertel, G. D. Literature review of early adolescence and implications for programming. In Katzenmeyer, C. G. & Rivkin, M. S. (Eds.) Early Adolescence: Perspectives and Recommendations to the National Science Foundation. Washington, DC, Directorate for Science Education, National Science Foundation, 1978. (ERIC/EDRS No. ED 168 900)

DESCRIPTORS: Science, Mathematics, Intermediate Grades, Mastery Learning

SHORT TITLE: Haertel, 1978, NSF Review

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

The review on instructional methods is only a small part of a large review on science teaching, learning and programs. As such, it provides a good overview but is neither extensive nor detailed.

SYNOPSIS:

This literature review begins with an analysis of literature on the characteristics of early adolescent learners, then presents findings on teacher preparation, the efficacy of junior high and middle school organization, the state of the art in math and science instruction, and data on the effectiveness of different instructional approaches to instruction for students of this age group. The next section of this abstract is concerned with the findings emerging from the research on instructional methods.

ITEM NUMBER: 333 SHORT TITLE: Haertel, 1978, NSF Review

RESEARCHER'S FINDINGS:

Science Instruction. Findings offered no firm empirical basis for the use of behavioral objectives. Studies of general instructional approaches (e.g., mastery learning, individualized instruction, instructional pacing) offer no strong support for any one approach. Science achievement and attitudes toward science have been shown to improve in response of activities such as trips to zoos, planetariums and museums.

Mathematics Instruction. Mastery learning has been shown to be very effective in enhancing the mathematics achievement of middle/junior high school students. Mastery learning has also been found to enhance attitudes toward mathematics. Research has not established the superiority of either ability grouping or whole class instruction for mathematics.

RESEARCHER'S CONCLUSIONS

Recommendations for research and practice are offered.

REVIEWER'S NOTES AND COMMENTS:

The report which includes this review is excellent. It includes a wealth of information on math and science instruction, together with an extensive bibliography. The bibliography may be found in the backup file on Intermediate Level Mathematics and Science Instruction.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 334 **LOCATION:** NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton **DATE REVIEWED:** June 1982

CITATION: Lysiak, F., Wallace, S., & Evans, C. S. *Computer assisted instruction. 1975-76 evaluation report*. A Title I program (revised). Fort Worth, TX: Fort Worth Independent School District, 1976. (ERIC/EDRS No. ED 140 495)

DESCRIPTORS: Mathematics, Reading, Intermediate Grades, Computer Assisted Instruction

SHORT TITLE: Lysiak, *et al*., 1976, Title I CAI

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a well-done and well-documented evaluation.

SYNOPSIS:

This report presents results of an evaluation of a CAI program in reading and mathematics in eight elementary schools and four middle schools. Title I participants in these schools practiced reading and math skills for ten minutes each, every day during the school year. The program consisted of sequenced strands in reading, mathematics and language arts; and was designed to assist teachers to individualize student instruction. Other Title I students in the area who received non-CAI supplementary instruction in math and reading served as the control group. At the elementary schools, half of each class worked at the CAI center terminals for 20 mintues of each class while the rest did seatwork; they then changed places. Printouts were checked weekly and individual lessons were developed. Middle school organizational patterns differed slightly, but instruction was delivered and progress checked in essentially the same way. Teacher and student opinions were surveyed, and students took standardized math and reading tests.

ITEM NUMBER: 334 SHORT TITLE: Lysiak, et al., 1976, Title I CAI

RESEARCHER'S FINDINGS:

Results differed for the different grade levels of participants, but generally speaking, CAI and control programs were equally effective in producing reading gains. Mathematics gains generally favored CAI students.

Elementary teachers perceived CAI as beneficial to student achievement; middle school teachers were moderately supportive of the practice. Student questionnaire responses indicated that students enjoyed CAI drill and practice and felt that it helped them to achieve at a higher level.

RESEARCHER'S CONCLUSIONS

"The Computer Assisted Instruction (C.A.I.) Program was very successful in terms of student achievement."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 335 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Yoshida, H. Effects of drill practice on aptitude in the learning of mathematics. Journal of Educational Psychology, 1980, 72, 706-715.

DESCRIPTORS: Mathematics, Intermediate Grades, Individualized Instruction

SHORT TITLE: Yoshida, 1980, Effects of Drill Practice

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a good short-term study, with data and analysis procedures clearly detailed.

SYNOPSIS:

The purpose of this study was to determine the effects on achievement produced by three different practice formats in mathematics instruction. Subjects were 135 Japanese fourth graders who were learning long division. They were pretested and then divided into five subgroups according to their ability level, as revealed by the test. For the next five days, the students received drill practice in one of three formats. One format, the "branching" type, subjects first received problems at a difficulty level matched with their ability level, and the problems given them each day were selected based on their performance on the previous day's drills. In the "mixed" type, students were given a sequence of problems over the five days work. In the "fixed" type, a series of problems selected from different difficulty levels were given to the students, regardless of those students' ability levels. Students were posttested at the end of the drill period.

ITEM NUMBER: 335   SHORT TITLE: Yoshida, 1980, Effects of Drill Practice

RESEARCHER'S FINDINGS:

"The results indicated that drill practice was effective for learners of all ability levels and that the fixed type, in which individualization was ignored, produced greater gains than the branching type, which was adaptive to a learner's ability, or the mixed type, which was composed of both the other types of drill practice..."

"...drill practice less adaptive to learner aptitude was an effective practice for learners drilled with problems above their ability."

RESEARCHER'S CONCLUSIONS

Several speculations were offered to explain the results which were obtained.

REVIEWER'S NOTES AND COMMENTS:

It should be noted that this study replicated findings from a similarly structured study conducted by the same researcher. A copy of the report may be found in the backup file on Intermediate Level Math and Science.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 336 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Ebmeier, H., & Good, T. L. The effects of instructing teachers about good teaching on the mathematics achievement of fourth grade students. American Educational Research Journal, 1979, 16 (1), 1-16.

DESCRIPTORS: Mathematics, Intermediate Grades, Direct Instruction, Inservice Teacher Education

SHORT TITLE: Ebmeier & Good, 1979, Effects of Inservice

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well designed and conducted. As well as convincingly demonstrating the effects of the experimental model, various interaction effects are noted and explicated.

SYNOPSIS:

This study was designed to determine what effects on student achievement might be obtained if teachers were exposed to information on proven instructional practices. The subjects were 39 fourth grade mathematics teachers, 19 of whom served as controls and 20 of whom participated in a training program designed to inform them about effective instructional practices with intermediate level students in mathematics. Data on teacher and student affective characteristics were gathered via survey instruments to see how these might relate to teacher training or lack of such training. The study took place over the course of a school year. Students were pretested at the beginning of the year, posttested at the end, and observors recorded information on the classroom behavior of experimental and control teachers. The program in which experimental teachers participated encouraged teachers to adopt the following six instructional practices: (1) to devote approximately 20 minutes per class period to developing conceptual understanding of mathematics; (2) to assign and grade student homework; (3) to ask more "product" (factual) questions and fewer "process" (conceptual) questions; (4) to assign only 10-15 minutes per day of seatwork and to keep students on task and check their work; (5) to conduct weekly and monthly class reviews of material covered; and (6) to monitor the rate of covering material and increase that rate when feasible.

ITEM NUMBER: 336 SHORT TITLE: Ebmeier & Good, 1979, Effects of Inservice

RESEARCHER'S FINDINGS:

Students of experimental group teachers, when taken as a group, had significantly higher achievement at the end of the school year than students of control teachers. Students with a history of low mathematics achievement made the greatest gains of all in the classes of experimental group teachers.

Interactions among student characteristics, teacher characteristics and treatment/no treatment are described at length.

RESEARCHER'S CONCLUSIONS

"The direct instruction model used in this study proved effective and substantiated earlier reviews of correlational research and the findings of [other researchers]. The large main effect produced by the experimental treatment in this study lends support to the direct instruction paradigm...and to the contention that teachers can and do make a difference in student learning."

Recommendations are made for future research designs.

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the Intermediate Math and Science backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 337 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Dekkers, J. Student cognitive and activity preference orientations in the inquiry science program, "FAST." Studies in Educational Evaluation, 1979, 5, 223-230.

DESCRIPTORS: Science, Intermediate Grades

SHORT TITLE: Dekkers, 1979, FAST and Student Preferences

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS X

RELEVANT ___ IRRELEVANT X FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

SYNOPSIS:

This study sought to determine if and to what extent the achievement of the goals of the FAST instructional program is congruent with the learning styles and preferences of program students. As such, it is somewhat off-purpose for the present project.

ITEM NUMBER: 337 **SHORT TITLE:** Dekkers, 1979, FAST and Student Preferences

RESEARCHER'S FINDINGS:

RESEARCHER'S CONCLUSIONS

REVIEWER'S NOTES AND COMMENTS:

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 338 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Madike, F. U. Teacher preparation and student achievement: An experimental comparison of microteaching with a traditional approach. Journal of Educational Psychology, 1980, 72, 866-874.

DESCRIPTORS: Mathematics, Intermediate Grades, Teacher Preparation Programs

SHORT TITLE: Madike, 1980, Microteaching Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well designed and conducted; it convincingly demonstrates the efficacy of microteaching in teacher preparation programs.

SYNOPSIS:

This study investigated the effects on student achievement resulting from two types of teacher preparation and from a no-preparation approach. Thirty-six Nigerian student teachers participated. In the first part of the study 12 of these teachers received five weeks of microteaching instruction and experience in nine skill areas: closure, stimulus variation, reinforcement, illustrating and use of examples, recognizing attending behavior, silence and nonverbal cues, and cueing. In addition to instruction and practice, these teachers also viewed videotapes of their classroom performance, received supervisor critiques, and were given the opportunity to repeat work in each area until the skill was mastered. A second group of 12 student teachers were apprenticed, in groups, to experienced teachers during the same five-week period. They observed, asked questions, periodically taught lessons and received supervisor feedback. A third (control) group of 12 student teachers were not given any specific preparation. In the second part of the study all 36 student teachers spent another five weeks teaching mathematics to classes of 16 seventh grade students of varying ability levels. Observors rated teachers' classroom behaviors, and participating students were pre- and posttested.

ITEM NUMBER: 338 SHORT TITLE: Madike, 1980, Microteaching Study

RESEARCHER'S FINDINGS:

Students of those teachers who had received microteaching instruction achieved significantly higher, and had significantly higher rates of classroom participation, than the students of either the traditional, teacher-supervised group or the no-preparation group.

There were no significant differences between the achievement levels or classroom participation rates of the teacher-supervised and no-preparation groups.

RESEARCHER'S CONCLUSIONS

"The microteaching teacher-preparation technique...is a promising, dependable...technique that teacher educators can effectively employ to enable beginning teachers to translate their genuine intentions into actual student achievement and participation in regular classroom activities."

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 339 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Madike, F. U. Teacher classroom behaviors involved in microteaching and student achievement: A regression study. *Journal of Educational Psychology*, 1980, *72*, 265-274.

DESCRIPTORS: Mathematics, Intermediate Grades, Teacher Preparation Programs

SHORT TITLE: Madike, 1980, Microteaching and Achievement

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS _X_

RELEVANT ___ IRRELEVANT _X_ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

SYNOPSIS:

This is a report of the same study reported in Item No. 338.

ITEM NUMBER: 339 SHORT TITLE: Madike, 1980, Microteaching & Achievement

RESEARCHER'S FINDINGS:

RESEARCHER'S CONCLUSIONS

REVIEWER'S NOTES AND COMMENTS:

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 340 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Bright, G. W., Harvey, J. G., & Wheeler, M. M. Achievement grouping with mathematics concept and skill games. Journal of Educational Research, 1980, 73, 265-269.

DESCRIPTORS: Intermediate Grades, Mathematics, Ability Grouping

SHORT TITLE: Bright, *et al*., 1980, Achievement Grouping for Math

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a well designed and conducted short-term study. The researchers referenced some limitations, but these were very minor.

SYNOPSIS:

This study examined the effects of homogenous and heterogeneous achievement grouping on mathematics learning through concept and skill games. Subjects were 164 seventh graders, half of whom were assigned to study probability and the other half of whom studied ordering of fractions. Half of each of these groups were assigned to small groups of three or four on the basis of pretests administered to determine ability level. The other half were randomly placed in their three- or four-person groups. These groups participated in learning games for twenty minutes twice a week over a four-week period.

ITEM NUMBER: 340 SHORT TITLE: Bright, et al., 1980, Achievement Grouping for Math

RESEARCHER'S FINDINGS:

Posttest scores were significantly higher than pretest scores for each of the four game-by-achievement-grouping combination. There were no treatment effects, nor were there sex or interaction effects.

RESEARCHER'S CONCLUSIONS

"...the results of this study provide additional evidence that games can be effective in promoting mathematics learning..."

"When considered together, the significant learning observed in all groups and the lack of significant treatment effects suggest that the ways students are grouped to play...skill games are not critical."

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 341 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Starr, R. J. Modern math plus computational drills: Affective and cognitive results. School Science and Mathematics, 1977, 77, 701-604.

DESCRIPTORS: Mathematics, Intermediate Grades

SHORT TITLE: Starr, 1977, Modern Math Plus Drills

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 [2] 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

No detail was provided on the instruction received by either the control or the experimental students.

SYNOPSIS:

This study investigated the effects of including computational drill exercises and teacher lectures in a modern mathematics program. Participants included two classes of eighth grade students with low abilities in mathematics. Half of the 60 students received modern mathematics instruction in computation with no supplementary activities. The other half received such instruction, together with drill worksheets and teacher lecture. Students took pre- and posttests in math computation and completed attitude instruments before and after the one-month treatment period. Complete data were available on 54 of the 60 students.

ITEM NUMBER: 341   SHORT TITLE: Starr, 1977, Modern Math Plus Drills

RESEARCHER'S FINDINGS:

There were no achievement or attitude differences between the two groups.

RESEARCHER'S CONCLUSIONS

"...there was no evidence that the use of traditional computational drills and lecture increased student achievement to a significant degree as compared with the achievements of students in 'modern' mathematics who were not exposed to drill and lecture. There was no apparent relationship between drills and student attitude toward mathematics."

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 342 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Cooney, T. J., Hirstein, J. J., & Davis, E. J. The effects of two strategies for teaching two mathematical skills. Journal for Research in Mathematics Education, 1981, 12, 220-225.

DESCRIPTORS: Mathematics, Intermediate Grades

SHORT TITLE: Cooney, et al., 1981, Two Strategies/Two Skills

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This short-term study was well carried out and corroborates the findings of previous researchers concerning the order of presentation of material in mathematics instruction.

SYNOPSIS:

This study investigated the relative efficacy of two strategies for teaching mathematics skills. Two classes of sixth graders, with 25 students in each class, were pretested on performing basic calculations, demonstrating an understanding of the process of multiplication, and using variables. Ten matched pairs of students were selected from the two classes based on pretest scores, IQ measures (110-125), and teacher recommendations regarding student ability and motivation. Two multiplication skills were taught to the two classes. In one class a "practice-understanding" strategy was used for the first of the two skills, with an "understanding-practice" strategy employed for teaching the second skill. This procedure was reversed in the other class. The basic difference between the treatments was the order in which concept understanding and skill application were introduced. Students were posttested at the end of the four-day instruction period for each skill, and were given retention tests a month after receiving instruction in each skill.

ITEM NUMBER: 342 SHORT TITLE: Cooney, et al., 1981, Two Strategies/
Two Skills

RESEARCHER'S FINDINGS:

"Both treatments were succesful in teaching both skills. The order of presentations of moves was not a significant factor affecting student achievement"

RESEARCHER'S CONCLUSIONS

"The results do not permit strong conclusions..."

"One observation is not reflected in the data but was noted by the two instructors during the treatments. Classes receiving the [understanding-practice] treatment were more difficult to control than those receiving the [practice-understanding] treatment. Apparently sixth graders are more easily distracted when the justification of a procedure is presented without an opportunity to practice it."

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 343 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Saunders-Harris, R., & Yeany, R. H. Diagnosis, remediation, and locus of control: Effects on immediate and retained achievement and attitudes. Journal of Experimental Education, 1981, 49, 220-224.

DESCRIPTORS: Science, Intermediate Grades, Mastery Learning

SHORT TITLE: Saunders-Harris & Yeany, 1981, 7th Grade Science Study II

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS X

RELEVANT ___ IRRELEVANT X FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

SYNOPSIS:

This is the same study as that reported in Item No. 332.

The backup file contains a copy of the JEE article.

ITEM NUMBER: 343 SHORT TITLE: Saunders-Harris & Yeany, 1981, 7th Grade Science Study II

RESEARCHER'S FINDINGS:

RESEARCHER'S CONCLUSIONS

REVIEWER'S NOTES AND COMMENTS:

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 344 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Wollman, W. T., & Lawson, A. E. The influence of instruction on proportional reasoning in seventh graders. Journal of Research in Science Teaching, 1978, 15, 227-232.

DESCRIPTORS: Science, Intermediate Grades

SHORT TITLE: Wollman & Lawson, 1978, Proportional Reasoning Study

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This short-term, small-scale study was well designed and carried out. Full detail on instructional approaches, results and analysis are provided.

SYNOPSIS:

This study compared the effects of an active, hands-on approach with those produced by a verbal, textbook-oriented approach, on the development of proportional reasoning skill among seventh grade students. The subjects were 28 students enrolled in two different classes. Students were pretested and then placed in one of two instructional groups. In the "active" group, each subject met with an experimenter for four 30-40 minute training sessions, during which they worked with manipulative materials in order to learn concepts of shape, volume and relationship. Subjects in the "verbal" group were individually tutored in four 30-40 minute sessions from a standard textbook, and then completed a series of applications exercises. Following the treatments, all students were posttested; and retention tests were administered one month later.

ITEM NUMBER: 344 SHORT TITLE: Wollman & Lawson, 1978, Proportional Reasoning Study

RESEARCHER'S FINDINGS:

Students instructed in the "active" mode had significantly higher achievement scores on both the immediate posttest and on the delayed retention test than those instructed in the "verbal" mode.

RESEARCHER'S CONCLUSIONS

"...individualized procedures based on the use of physical materials are more effective than verbal textbook procedures in teaching students to solve problems involving the formal scheme of proportionality. The finding that this superiority remained on the delayed posttest indicates that the effects were lasting."

REVIEWER'S NOTES AND COMMENTS:

See the backup file for a copy of the article.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 345 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: McMillan, J. H., & May, M. J. A study of factors influencing attitudes toward science of junior high school students. Journal of Research in Science Teaching, 1979, 16, 217-222.

DESCRIPTORS: Mathematics, Intermediate Grades, Student Attitudes

SHORT TITLE: McMillan & May, 1979, Student Attitudes Toward Science

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 [2] 3 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is an attitude survey rather than a comparative study, but it does offer evidence for instructional and affective approaches which can enhance student attitudes toward science.

SYNOPSIS:

This study sought to determine what factors affect the attitudes of students toward science and science instruction. Fifty-three students in grades six, seven and eight, were selected from a Denver junior high school. Subjects were from middle- and low-SES families; about three-quarters were Anglo American and one-quarter were Mexican American. Subjects were individually interviewed, with interviewers recording their responses to eight questions regarding their attitudes about science content and science classes.

ITEM NUMBER: 345 SHORT TITLE: McMillan & May, 1979, Student Attitudes Toward Science

RESEARCHER'S FINDINGS:

Most students: (1) liked experiments, investigations, dissecting and other hands-on activities best; (2) liked writing assignments and tests least; (3) said their parents had no influence on whether they liked science; (4) said that the most important influences on whether they liked science were the teacher and the class activities.

In some cases males and females responded differently, e.g., males favored teachers who helped, explained clearly, conducted interesting science class activities, etc.; while females responded most favorably to teachers who were "nice," "liked kids." etc.

RESEARCHER'S CONCLUSIONS

"The results from this investigation suggest the need for the teacher to develop positive relations with students, to stress classroom activities which involve active learning and student participation, and to engage students in the subject, so that meaningful effort and investment is assured."

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 346 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Cohen, M. P., & Walsh, M., Sr. The effects of individualized instruction on learning and retention of a geometry unit in junior high school. International Journal of Mathematical Education in Science and Technology, 1980, 11, 41-44.

DESCRIPTORS: Mathematics, Intermediate Grades, Individualized Instruction

SHORT TITLE: Cohen & Walsh, 1980, Individualized Geometry

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This was a very well-done study and a well-detailed study report.

SYNOPSIS:

This study compared the effects of individualized instruction with those resulting from traditional instruction in promoting achievement and retention of concepts in geometry. Subjects were 119 seventh and eighth grade students, half of whom were randomly assigned to the individualized instructional treatment and the other half to the traditional treatment. The individualized group used the SRA Computapes, consisting of 20 taped lessons in geometry concepts and skills. Each tape was accompanied by worksheets containing illustrations and sample problems. In the traditional group, students were given oral and written drills and assignments from a standard geometry textbook. Students were pretested initially, then participated in instruction for 45 minutes per day over a six-week period. A 53-item achievement posttest was administered, and students took a retention test three weeks later.

ITEM NUMBER: 346 SHORT TITLE: Cohen & Walsh, 1980, Individualized Geometry

RESEARCHER'S FINDINGS:

No statistically significant differences were found between the two groups on either the achievement posttest or the retention tests. There were no significant interaction effects with initial student ability level.

RESEARCHER'S CONCLUSIONS

"The results of the study do not indicate a significant effect on learning or retention due to the mode of instruction. However, examination of the tables reveals a slight trend favoring the individualized group."

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 347 LOCATION: NWREL Info. Center/ERIC MF

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: Downes, J. P., *et al.*, *76 questions: A synthesis of the research on teaching and learning mathematics*. Atlanta, GA: Georgia State Department of Education, Office of Instructional Services, 1978. (ERIC/EDRS No. ED 162 896)

DESCRIPTORS: Mathematics

SHORT TITLE: Downes, *et al.*, 1976, 76 Questions

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a very good review, with considerable detail on methods, studies reviewed and specific mathematics skills and their acquisition.

SYNOPSIS:

This report is a summary of research findings compiled in order to respond to questions most frequently asked by teachers and administrators about mathematics teaching and learning. A concise summary of major studies and reviews is presented within the six general categories of planning for instruction, instructional procedures, differentiating instruction, methods of instruction, problem solving and evaluation.

ITEM NUMBER: 347   SHORT TITLE: Downes, et al., 1978, 76 Questions

RESEARCHER'S FINDINGS:

The following highlights are selected from the many research findings cited:

> Teacher behaviors found to enhance student motivation and attitudes include being aware of students' needs, interests and abilities; varying teaching strategies; creating a challenging classroom environment; having competencies in the area of mathematics; and being able to deal efficiently with disruptions.
>
> No one organizational pattern is superior to others. The teacher's ease in and commitment to a given organizational structure are more important.
>
> Regularly assigned homework is an important factor in achievement.
>
> The use of manipulative materials in the early grades is supported by research. Opinions and feelings are strong on the subject of in-class calculator use, but research is not conclusive as to effects.
>
> Research supports increasing the time devoted to mental computation and estimation in math classes. Heuristic problem solving should be taught.
>
> (Many specific math skills and teaching methods for them are cited.)

RESEARCHER'S CONCLUSIONS

None drawn. The report ends with a series of recommendations for topics judged to be "essential or desirable criterion-referenced test objectives for secondary mathematics programs."

REVIEWER'S NOTES AND COMMENTS:

The backup file contains a copy of the article.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 348 LOCATION: PSU Library

REVIEWER: K. Cotton DATE REVIEWED: June 1982

CITATION: O'Sullivan, P. S., Piper, M. K., & Carbonari, J. P. *A model for the effect of an inservice program on junior high school science achievement*. Journal of Research in Science Teaching, 1981, *18*, 199-207.

DESCRIPTORS: Science, Intermediate Grades, Inservice Teacher Education

SHORT TITLE: O'Sullivan, *et al*., 1981, Science Teacher Inservice

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This study was well done and convincingly demonstrates the efficacy of ever minimal amounts of inservice education of the kind presented.

SYNOPSIS:

This study investigated the effects of a teacher inservice program on the achievement of the students of those teachers who participated. Thirty-five junior high school science teachers, 15 experimental and 20 control, participated in the study. Experimental teachers participated in a one-day inservice program which stressed selected instructional strategies involving the use of science laboratories. The program was designed both to improve the teachers' skills in using laboratory instructional strategies and to improve their attitudes toward using laboratory strategies. Following the inservice program, experimental and control teachers conducted science instruction over a six-month period. Records of classroom activities were kept to determine the degree to which program strategies were implemented. Pre- and posttest data were available for 2,590 of the students taught by experimental and control teachers.

ITEM NUMBER: 348 SHORT TITLE: O'Sullivan, et al., 1981, Science Teacher Inservice

RESEARCHER'S FINDINGS:

Achievement levels of students taught by experimental group teachers was higher than that of the students of control teachers, though differences were not statistically significant.

RESEARCHER'S CONCLUSIONS

"...this study demonstrates that inservices that are specifically designed to emphasize instructional strategies appropriate to the science laboratory can help to meet the needs of junior high school science teachers who do not feel adequately prepared to teach these students."

REVIEWER'S NOTES AND COMMENTS:

A copy of the article may be found in the backup file.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 349 **LOCATION:** NWREL Info. Center/Periodicals

REVIEWER: K. Cotton **DATE REVIEWED:** July 1982

CITATION: Horak, V. M. A meta-analysis of research findings on individualized instruction in mathematics. Journal of Educational Research, 1981, 74, 249-253.

DESCRIPTORS: Mathematics, Elementary Secondary Education, Individualized Instruction

SHORT TITLE: Horak, 1981, Mathematics Meta-Analysis

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 [4] 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a well done analysis of a large body of research.

SYNOPSIS:

This investigation was undertaken to determine the effects of individualized instruction on the mathematics achievement of elementary and secondary students. The modern meta-analysis technique was employed, owing to the capability of this technique to detect the degree to which a treatment affects outcomes. Using the data gathered by a previous researcher on the efficacy of a self-paced, modularized approach to individualized instruction, the present researcher applied to meta-analysis methods to compare the outcomes of this approach with those produced by more traditional mathematics instrution. A total of 129 comparisons, and the effect size obtained for each, comprised the support for the conclusions reached.

ITEM NUMBER: 349 SHORT TITLE: Horak, 1981, Mathematics Meta-Analysis

RESEARCHER'S FINDINGS:

First, the author reviewed the findings of the original reviewer (Schoen. 1976, 1977), which indicated no significant, overall differences favoring individualized mathematics instruction.

The author's own findings, arrived at through the meta-analysis method, "indicate that individualized approaches offer positive results in many instances." Results showed that these programs better meet students needs; that individualized modules are especially effective for grades 7-9, whether standardized tests or teacher-developed measures are used; and that studies with both long and short treatment periods revealed results favoring individualized instruction.

RESEARCHER'S CONCLUSIONS

Conclusions are essentially the same as findings, as both are synthesized from a large number of studies.

The author concludes, further, that this analysis lends support to the utility of the meta-analysis method, with its more rigorous statistical methods and its sensitivity to effect size.

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 350 LOCATION: NWREL Info. Center/Periodicals

REVIEWER: K. Cotton DATE REVIEWED: July 1982

CITATION: Gershman, J., & Sakamoto, E. Computerized instruction for intermediate mathematics. Orbit, 1980, 11 (5), 10-12.

DESCRIPTORS: Intermediate Grades, Mathematics, Computer-Assisted Instruction

SHORT TITLE: Gershman & Sakamota, 1980, Intermediate CAI

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE X SECONDARY SOURCE ___ DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 [3] 4 5 (Strong)

BRIEF DISCUSSION OF RATING:

This is a detailed and informative description/evaluation.

SYNOPSIS:

This is a description and evaluation report of the Computer-Assisted Remediation and Evaluation (CARE) Project in East York and Toronto, Ontario. Major project objectives were to create and evaluate computer-assisted instruction sequences for grades 7-10 and to produce and validate test items for use in other settings. Pilot tests of the CARE program were conducted at 17 schools and involved more than 2,000 students. Experimental and comparison students were pretested in September, after which the latter received traditional intermediate-level math instruction, and CARE students engaged in CAI coursework featuring lessons, tests and a branching strategy (whereby the computer takes a student from one part of the course to another, depending on performance). The CARE approach provides random problem generation, instant answer analysis and feedback, and detailed student progress reports. Much of the application work is offered in the form of math games. Students were posttested in January and CARE participants completed an attitude survey.

ITEM NUMBER: 350 **SHORT TITLE:** Gershman & Sakamoto, 1980, Intermediate CAI

RESEARCHER'S FINDINGS:

CARE students improved significantly from pretest to posttest, but also improved significantly more than non-CARE students.

Both CARE students and their teachers gave very positive responses on the attitude measures administered.

RESEARCHER'S CONCLUSIONS

None drawn.

REVIEWER'S NOTES AND COMMENTS:

None.

SCHOOL EFFECTIVENESS PROJECT, ITEM REPORT

ITEM NUMBER: 351 LOCATION: Project Files

REVIEWER: K. Cotton DATE REVIEWED: July 1982

CITATION: Driscoll, M. Research within reach: Elementary school mathematics. St. Louis, MO: Research and Development Interpretation Service, CEMREL, Inc., 1980.

DESCRIPTORS: Intermediate Grades, Mathematics

SHORT TITLE: Driscoll, 1980, Research Within Reach-Math

SKIMMED, REJECTED FOR PROJECT PURPOSES, NO ANALYSIS ___

RELEVANT X IRRELEVANT ___ FOR PRESENT PURPOSE

PRIMARY SOURCE ___ SECONDARY SOURCE X DISSERTATION ABSTRACT ___

RATING OF QUALITY OF STUDY (for project purposes):

(Weak) 1 2 3 4 [5] (Strong)

BRIEF DISCUSSION OF RATING:

This is an extensive, detailed, clear and practical synthesis of findings on effective instructional practices in elementary mathematics.

SYNOPSIS:

This is a series of 21 bulletins which provide answers to questions frequently asked by teachers concerning mathematics instruction in the elementary grades. Staff of the Research and Development Interpretation Service developed the questions from a survey of K-6 mathematics teachers, then initiated a process of information search, retrieval, analysis and synthesis in order to provide research-based answers which would be useful to classroom practitioners. Each set of findings, as expressed in the bulletins, was reviewed and revised based on input from a panel of prominent researchers and other experts in the field of mathematics education.

The information presented in the next sections of this abstract have to do with mathematics instruction at the intermediate level.

ITEM NUMBER: 351 SHORT TITLE: Driscoll, 1980, Research Within Reach-Math

RESEARCHER'S FINDINGS:

Manipulative materials can help develop conceptual understanding and the transfer of understanding to new areas; they also engage and motivate children. Use of manipulatives needs to include introduction of more symbolic approaches to problem solving.

Effective instruction in measurement involves provision of a wide variety of measurement experiences, including those which involve fractions of length, time, etc. Use of everyday situations and down-to-earth language is advocated.

Research on diagnosis indicates that the following are effective: using multiple measures, including observation and interview; and maintaining a supportive and accepting stance during diagnosis.

Remedial instruction should involve new material and approaches; it should not merely repeat the original instruction. Children should be encouraged to estimate answers. Use of calculators is an asset in both regular and remedial instruction.

Mastery learning is very effective in teaching/acquiring mathematics skills.

Daily drill in combination with the introduction of new material, fosters retention of material learned.

No one organizational or grouping pattern is intrinsically superior to others. Teaching strategies, teacher preference and children's needs should govern the choice of structure.

At least some degree of individualization is advocated for the mathematics program to be maximally effective.

Algorithemic techniques are helpful and research indicates that virtually all children can learn them.

RESEARCHER'S CONCLUSIONS

Conclusions are essentially the same as findings in this report. An overriding conclusion drawn is that the approach of the teacher is the single most important factor in producing mathematics competency among elementary students.

REVIEWER'S NOTES AND COMMENTS:

The bulletins are in the backup file. Extensive references are included, along with information on specific instructional practices shown to be effective.